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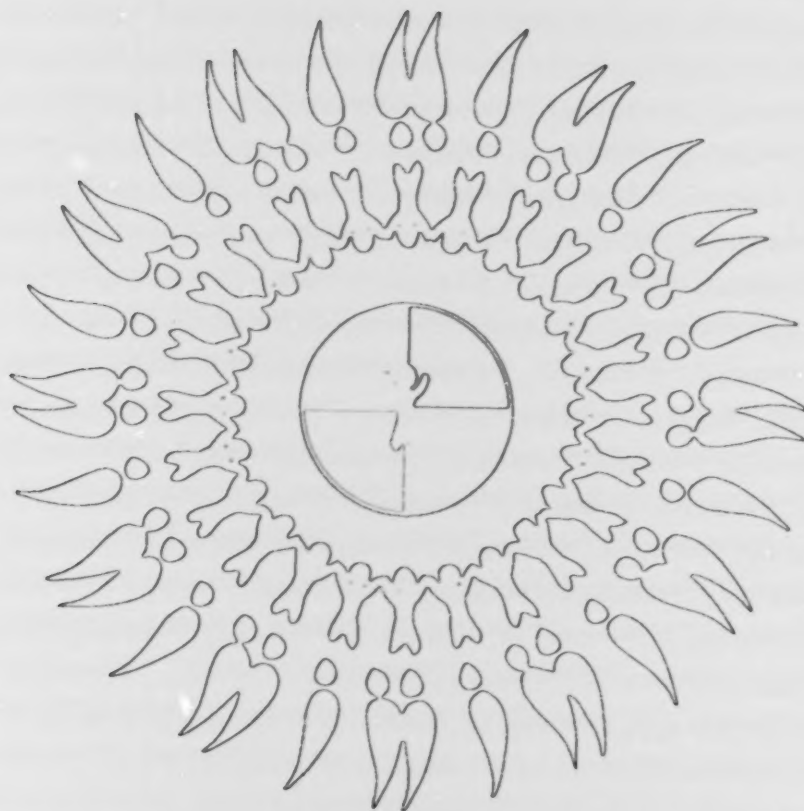
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ABSTRACT

This guide attempts to help teachers of American Indian students in grades 7-8 provide a culturally relevant education that takes place in the regular classroom, includes content related to Indian students' lives, makes students proud, expands to other experiences, and enhances learning. Creating sacred places means responding appropriately to students' academic, social, emotional, physical, and spiritual needs. Research has shown that to empower Indian students to learn, their school programs must incorporate their language and culture, involve parents and community as partners, provide appropriate instruction, and use appropriate testing methods. The approach presented here combines the teaching of various subject areas and reinforces classroom instruction with language and cultural activities by using American Indian literature as a basis for instruction. Materials and activities are aligned with challenging content standards. This guide outlines 24 thematic units, which include background information, relevant Indian literature, objectives, activities, evaluation methods, and content standards. Eight science-based units cover electricity; oil and gas; use of plants; man, animals, and plants; sun, moon, and stars; abuse of alcohol and drugs; water; and Indian art. Eight social studies and history-based units cover tribal histories, before 1492, 1492 and the 1500s, 1600s and 1700s, 1800-68, 1869-99, 1900-52, and 1953-2000. Eight language arts-based units cover contemporary Indian young people, student writing, oral tradition and oratory, Indian stories, Indian biographies, poetry, short stories, novels, and American Indian and Alaska Native authors. A final section lists additional resources and sources for books. (SV)

Creating Sacred Places for Students in Grades 7 & 8



by
Sandra J. Fox D.Ed.

**National Indian School
Board Association**

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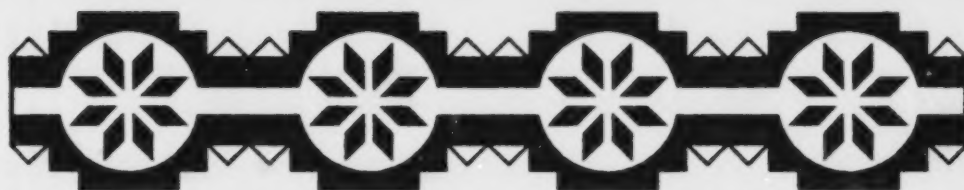
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Creating Sacred Places for Students in Grades 7 & 8



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Sandra J. Fox D.Ed.

8 Science-Based Units
8 History/Social Studies-Based Units
8 Language Arts-Based Units



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Association, © 2001**
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INTRODUCTION

This book is an attempt to help teachers provide the culturally relevant curriculum that has long been the dream of Indian educators. The relevant curriculum that we have envisioned takes place in the regular classroom, includes content related to the lives of Indian children, makes them proud, expands to other experiences and enhances learning.

It used to be that there was some funding available to develop culturally relevant curricula, and some materials were developed. Few of those materials are still available, and the funding has all but disappeared. There is a renewed interest in this dream, however, and Indian literature is a resource that can provide the basis for a comprehensive culturally relevant curriculum. There are many more Indian authors writing books for children and more good Indian literature is being published.

This document provides teachers with background, materials (Indian literature), and activities for 24 units: eight are science-based thematic units, eight are social studies/history-based, and eight are language arts thematic units, all for students in grades 7 & 8. They are aligned with new, required science, social studies/history, language arts and mathematics content standards so that teachers are teaching what is expected of them and, at the same time, are making instruction more meaningful to the students. The units are to be integrated or multidisciplinary. The approach promotes the close coordination and cooperation of regular and cultural instruction teachers and their work. This is not a canned curriculum; it contains the ingredients necessary for a school to develop its own culturally-based curriculum for the junior high or middle grades.

This document also pays tribute to many: Indian and other authors who write books for and about Indians, Indian and other organizations that distribute books by and about Indians, Indian and other organizations that have made the improvement of teaching Indian children their aim, and teachers who have developed and implemented culturally-based curricula in their classrooms.

Some of the materials and activities included here have been taken from the work of others. For example, some of the teacher's background information included comes from math and science materials developed by ORBIS Associates of Washington, DC. The math and science activities included were developed by teachers of Indian children at summer workshops at Haskell Indian Nations University taking place from 1992-1994. I have drawn on the work of educators such as Richard Nichols, Gwen Shunatona and Anne Litchfield of ORBIS Associates; and Dan Wildcat, Lucretia Herrin, Dr. Michael Ward and Anita Chisholm who led the math and science workshops at Haskell.

I have not read every book listed in this document, and if I did, I would not be able to guarantee their being free of cultural bias or inaccuracies. I did utilize the publication *Through Indian Eyes: The Native Experience in Books for Children* by Beverly Slapin and Doris Seale to avoid books that may be offensive. I tried to promote books written by Indian authors. I recommend that books be reviewed by local Indian people to be sure they are appropriate. If it is found that a book is not acceptable to Indian people or to a tribe, especially, the book should definitely not be used. There is guidance for reviewing books and curriculum materials in *Through Indian Eyes* and in a document developed by the Indian Community School of Milwaukee listed in the last section of this book. I would like to know if there is a book that should definitely be eliminated from this document. If the use of the approach outlined in this document works, it should promote a resurgence of local storytelling and/or the writing of more children's books by Indian people.

The development of this document is part of an effort of the National Indian School Board Association to provide an Indian model of school reform that includes the Effective Schools framework with several enhancements: tribal values and organizational culture; wellness, healing and prevention strategies; leadership based on vision, wisdom and courage; the Learning Record performance-based assessment system; and the integration of Indian curriculum.

It is hoped that this document will be useful to parents, tutors, teachers, aides, administrators and school board members at schools where there are Indian students. I hope that Title IX and Johnson O'Malley programs can utilize it. I hope that parents who are homeschooling their children will find it helpful. I hope that teachers of nonIndian students will use it, especially for that week at Thanksgiving and, hopefully, beyond.

Most of all, I hope this document will help students somewhere. I greatly enjoyed developing it. I hope others will enjoy using it to create sacred places for Indian young people.

-SJF, Oglala Lakota, Albuquerque, NM

CREATING SACRED PLACES

Creating Sacred Places means responding appropriately to students' academic, social, emotional, physical and spiritual needs. This document addresses improving the teaching of Indian students and empowering them to learn by addressing these needs. The research is quite clear on the matter. If Indian students are to be empowered to learn, their school programs must include four characteristics (Cummins, The Empowerment of Indian Students):

1. Language and culture must be incorporated into the school program.

Considerable research suggests that for minority groups experiencing school failure, the extent to which students' language and culture are incorporated into the school program constitutes a significant predictor of academic success. Educators who see their role as encouraging their students to add a second language and culture to supplement rather than supplant their native language and culture are more likely to create conditions in which students can develop a sense of empowerment. Educators who see their role as getting their students to replace their home language and culture with English and white values in order to assimilate them into the dominant culture are more likely to create the conditions for student failure. Students who develop skills in two languages have been found to have learning advantages over students who have only one language.

2. There must be an unbreakable bond between school and community.

When educators involve parents as partners in their children's education, parents communicate to their children a positive attitude toward education that leads to improvement in the students' academic achievement. Teachers operate along a continuum from collaborative to exclusionary. Teachers with a collaborative orientation work closely with teachers or aides fluent in the student's first language and/or knowledgeable of the community in order to learn from them how to communicate effectively with parents. Teachers with an exclusionary orientation tend to regard teaching as their job and are likely to view collaboration with parents as either irrelevant or actually detrimental to children's progress. Students can become empowered only when education becomes a true community enterprise involving an equal partnership between educators at school and educators in the home, the children's families. In addition, the collective experience of the community must be used as the context for all learning in the school.

3. Appropriate instruction must be provided.

Research indicates that the learning difficulties of minority students are often caused by the way we teach them. These students frequently receive intensive instruction that confines them to a passive role and induces a form of "learned helplessness." This kind of instruction follows the transmission model in which it is the task of the teachers to impart knowledge or skills they possess to their students who do not yet have these skills. The teachers initiate and control the interaction, constantly orienting it toward the achievement of instructional objectives. In contrast, the experiential-interactive model of instruction focuses on giving students hands-on classroom experiences that provide students with a basis for understanding more abstract academic curricula. The interactive model also incorporates what we know about the relation between language and learning and promotes language-rich classrooms. The transmission model entails the suppression of students' experiences. The experiential-interactive model entails an additive orientation toward students' cultures and languages, an openness to collaborate with community resource persons, and active use of written and oral language skills. Learning styles of students must also be taken into account.

4. Appropriate testing must be used.

Classroom and psychological testing have disempowered and disabled minority students. Minority students are overrepresented in special education because of improper testing. To challenge the disabling of minority students, assessments must focus on the extent to which children's language and culture are incorporated within the school program, the extent to which educators collaborate with parents as partners in a shared enterprise, and the extent to which children are encouraged to use language (both tribal and English) actively within the classroom. In other words, the primary focus should be on remediating the educational interactions that Indian children experience. Further, it is being recognized that, while formal testing has a role to play, its impact is considerably greater when combined with classroom assessment. The longitudinal observation and monitoring of student progress throughout the school year by classroom teachers yields valuable data and is much more accurate and fair than formal testing, thus the present emphasis on performance-based assessment.

These four characteristics that address needs of Indian students must be considered carefully by every school seeking to educate Indian learners. Consider this quote from Ron Edmonds of the Effective Schools movement:

We can, whenever and wherever we choose, successfully teach all children whose schooling is of interest to us. We already know more than we need to do that. Whether or not we do it must finally depend on how we feel about the fact that we haven't so far.

We are at a time when it is being demanded that schools produce higher achievement. Students must learn to read and write at higher levels, they must be able to solve more difficult math and science problems, they must be adequately prepared to meet the world and function successfully in the 21st Century. We must change the way we do things in order to produce these results. Schools have been failing students. Part of the problem is that we don't do what we know should be done, as Ron Edmonds states. We don't listen to what the research says.

Schools are involved in various school reform activities at this time. Teachers are being asked to do many things including:

- align curriculum with the new content standards and new assessments,
- do a better job of teaching reading and math,
- utilize an integrated approach to teaching the various content areas,
- teach for understanding and application and focus on depth,
- teach disabled and gifted students in the regular classroom,
- promote positive student behavior through a school-wide approach, and
- provide meaningful parental involvement in the instructional process.

In addition, teachers of American Indian students are asked to:

- incorporate American Indian content standards,
- provide instruction for Indian children that is based upon research,
- provide culturally relevant instruction within the regular classroom, and
- promote the use of native languages to strengthen children's language ability.

This is only a partial list of the many things that teachers have to do. This document will provide assistance to teachers who really want to create sacred places for children and will help coordinate all that they have to do.

Essentially, the approach presented here combines the teaching of various subject areas and reinforces classroom instruction with language and cultural activities by utilizing American Indian literature as a basis for instruction. The materials and activities are aligned with the new, more challenging science, social studies/history, language arts and math content standards and American Indian content standards for each area.

To use the approach recommended by this book, teachers must –

1. Work closely with the cultural instructors at the school. The regular teacher and the cultural instructor should team teach these units. If not, the cultural instructor must provide input to the regular teacher to help integrate local culture into the regular classroom. A less effective approach would be that both the regular teacher and the cultural instructor teach the same topic, but separately. The science units provide good language immersion topics for teaching the native language while reinforcing classroom instruction. This would also be ideal.
2. Decide what units to teach and what order to teach them in. If all the teachers of the junior high or middle grades are using this book, they may want to determine which units each class will use. If you are the only teacher in those grades using this book, you may want to use all of the units or only some of them. They are organized in an order. For example, the science units start with Electricity in September when there still may be lightning; Oil and Gas in October; Use of Plants including foods in November with Thanksgiving; Man, Animals and Plants in the winter when most storytelling takes place – for example, coyote stories; Sun, Moon and Stars when it is best to observe the night sky, Abuse of Alcohol and Drugs in February or March; Water around Earth Day; and Indian Art just before school is out. You can also align them with what you are already teaching.
3. Decide what literature and activities to use. Of course, literature that deals with the local tribe(s) would be best. You will want a variety of literature to reach various students in your classroom. The example activities included can be adapted to your own tribe(s) and to the grade level you teach. Include your own ideas for additional materials and activities. Work closely with your librarian.
4. Align the McREL standards with your own content standards. The standards included were developed by the Mid-Continent Regional Educational Lab (McREL) and summarize all the state standards. You will want to cross check them with the content standards your school has chosen to follow. Review the standards to give you ideas for further activities and more cultural information. The language arts and math standards cover all units in the book.
5. Plan a parental involvement strategy. Let the parents know what are studying. Be sure there are regular, meaningful parent involvement activities for the units.
6. Utilize good teaching strategies. Continue to utilize cooperative learning, have students read widely, use literature circles where various students are assigned to formulate questions for the reading, find interesting words, find interesting parts, etc. Many of the suggested activities are based on constructivism or project-based learning.
7. Utilize a form of performance-based assessment to track student progress.



ELECTRICITY

Electricity has provided for great advances in the lifestyles of American Indian people. It has also contributed to destruction. Tribes have their stories of when electricity first came to their lands and what it has done for them, and some have stories of how their natural resources are used in the creation of electricity for them and for others. Many tribes have rigorously taken on the task of protecting their natural resources now and have developed courses to teach about such things. One of the goals of such a course in the Northwest is "To understand how positions of power and differing values of natural systems by Euro-Americans have influenced changes in Pacific Northwest ecosystems and lifestyles since the time American Indians managed the lands." – American Indian Perspectives: Nature, Natural Resources and Natural Resources Education, Chemeketa Community College, 1999.

LITERATURE FOR UNIT –

How Thunder and Lightning Came to Be by Beatrice Orcutt Harrell (**Indian Author**), Dial, 1995.

Indian Legends of the Pacific Northwest by Ella E. Clark, University of California Press, 1971, p. 165.

Red Ribbons for Emma by New Mexico People and Energy Collective, New Seed Press, Berkeley, CA, 1981. Conflict between Native peoples and power companies.

ACTIVITIES FOR UNIT –

1. Have the students learn about electricity and its uses, read cultural materials and hear cultural perspectives relating to this topic, and observe electrical systems.
2. Have students research the coming of electricity to their land/reservation. How did it affect the people and the land? Have them make lists of positive and negative effects. How much does electricity cost? How else is math involved?
3. Are any of the local tribes' natural resources used in the provision of electricity to the tribe and to others? Have students research how this has affected the people and the land. Have them make lists of positive and negative effects.
4. Have the students write a joint project article for the local newspaper delineating their findings with charts, graphs, etc. Give each student an assignment for the project.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University. Adapt these activities to meet the needs of your students. Also, review the science standards for this unit. They will suggest further science and math activities.

SCIENCE --

"ELECTRICITY, WHAT IS IT?"

CULTURAL OUTCOME: IV

SCIENCE OUTCOME: V

CULTURAL OBJECTIVE:

Students will understand that all parts of nature have been given to us to respect and use wisely.

SCIENCE OBJECTIVES:

Students will:

identify the nature of electricity and describe its modes of production and measurement

compare different sources of energy and identify the benefits and problems associated with each source

define characteristics and behavior of electrical energy and its uses.

TEACHER'S BACKGROUND INFORMATION:

This unusual concept of Thunder and Lightning is given in the words of Andrew Joe, a Skagit on the Swinomish Reservation in Indian Legends of the Northwest.

In the beginning of the world, Thunder and his family lived in a lake. His wife was Rain. His children were Lightning and Hail. Then Old Creator placed him up above, to control the weather and to control the air in which everyone would live on earth.

After putting him in the sky, Old Creator gave Thunder a special spirit power and said to him, "Your spirit power will be discovered and will be brought back to earth to be of great use to the human race."

Thunder's spirit power was discovered in our own country. It is electricity, and it is of great use to the human race. Nothing can live without the electricity in the air.

STUDENT LEARNING ACTIVITIES:

1. A Safety Warning

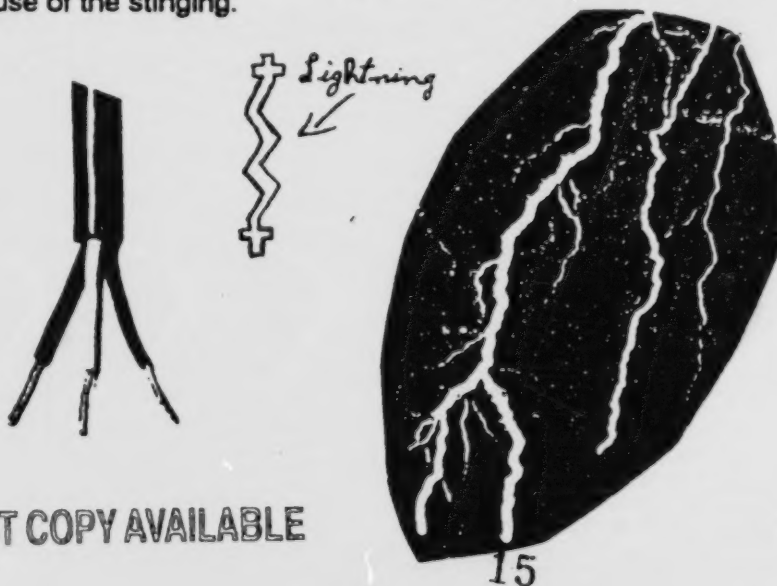
The teacher should caution the students to never try this, or any other, experiment we do in school with other forms of electricity such as house current or larger batteries such as 5 volt or a 12 volt battery. Impress upon every student that **ELECTRICITY CAN KILL IF PEOPLE ARE NOT CAREFUL WITH IT; IN ADDITION, WARN STUDENTS TO NEVER PLUG INTO A WALL SOCKET ANY OF THE MATERIALS USED IN THESE EXPERIMENTS. REMEMBER, SOME ELECTRICAL DEVICES STORE ENOUGH ELECTRICAL ENERGY TO CAUSE DEATH OR SEVERE INJURY.**

2. Everyday Uses

List ways electricity is used in their everyday lives (lamps, refrigerators, radios and televisions, etc). Discuss the concept that electricity has the ability to do work and is a form of energy that can be felt.

3. Feeling Electricity

A safe experiment uses insulated copper wire with almost 1" of insulation removed from each end. Cut the wire into two pieces and connect one to the negative and one to the positive pole of a C or D size battery. Have the students touch the wires to the tip of their tongue so they can feel a small sting from the electricity. Discuss what the students felt and tell them that the electrons in the battery were the cause of the stinging.

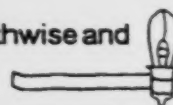


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4. Making a Closed Circuit

Get a piece of cardboard about the size of a piece of notebook paper. Place it on the desk with the short sides at the top and bottom. Tape a 16-inch long strip of aluminum foil, about 1 inch wide, in a C shape from the center of the top, around the left side, and to the center of the bottom piece. Tape another narrow strip, about 8 inches long, from the center of the bottom and up the right side, leaving about 1 inch space of space between the pieces.

Fold another 1 inch wide, 8 inch long piece of foil in half lengthwise and wrap one end around the bottom of a flashlight bulb.



Fasten a wooden, spring type clothes pin onto the bottom of the bulb, leaving the tip of the bulb free. Position the clothes pin so that the bottom of the bulb touches the end of the foil. The foil on the bulb should not touch the foil strip. The clothes pin should not be taped in place.

The positive end of one battery should now touch the negative end of the other battery. Have the other members of the team tape the batteries together.

The batteries are taped to the circuit board. The foil strip should be pressed against each end of the battery. A rubber band should be used to wrap the batteries tightly together.

The switch has now been made with the 2 loose pieces of foil. If you want to close the switch, touch the loose ends together. If the light bulb lights up, you have completed the switch correctly. If the light bulb does not light up, go back and try to connect the switch again.

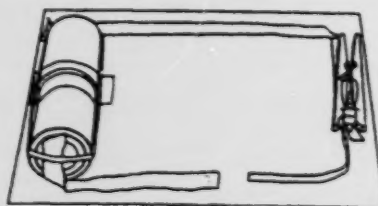
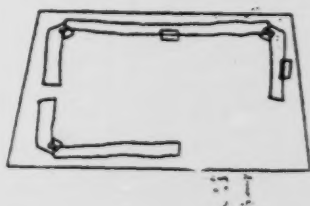
If the light bulb does not work, check the following:

Are there any tears in the foil?

Does the foil on the bottom of the bulb touch the long piece of foil?

Are the batteries wrapped together tightly?

If the light bulb still does not work, ask for another set of batteries and a bulb.



EVALUATION ACTIVITIES:

After the activities, ask students the following questions:

1. How did you feel when the electricity stung your tongue? Did you taste the electricity? What did it taste like?
2. What tool do you need to strip the wire? Why do you have to strip the insulation off of the wire? What does the copper do?

RESOURCES:

Bahti, Tom. Southwestern Indian Ceremonials. Kansas City, Missouri: Kansas City Publications, 1982.

Clark, Ella E. Indian Legends of the Pacific Northwest. Los Angeles, California: University of California Press, 1953, 1971, p. 165.

Houghton, Janaye M. "Sensing Circuits." Super Science Blue Edition. Vol. 3, No. 6, March, 1992: pp. 18-23.

DEVELOPED BY:

Elaine Hendricks
Diane Cleveland
Renata Griego



SCIENCE/MATH -

"Electrical Energy"

DAY ONE

1. Free exploration

- a. Set up stations with the various electrical equipment such as radio, electric pencil sharpener, computer, VCR, toaster, lamp, popcorn popper, or clock.
- b. The students move from station to station in groups or individually to areas of interest.
- c. Come back to group to discuss the following:
 - commonality
 - difference
 - most interesting, why?
 - most useful, why?
 - most recreational, why?
- d. Set up a bucket of water on one side of a table and an electric pencil sharpener on the other. How are these related? How can we get from (a) bucket or reservoir or water to (b) electric pencil sharpener? List possible answers and then show the diagram drawn by Byron Dean showing reservoir to house.
- e. Discuss what questions to ask a representative of a local power company?
 - What is the major source of energy for community? Has the source changed in the past? What are the future sources of electrical energy?

DAY TWO

1. Continued free exploration with Day I stations.
2. Call to set up a field trip or a visit from representative from the local power company. Ask questions from Day I discussion.
3. Brainstorm or set up group learning stations to discuss the field trip or visit from power representative.
4. Use the language development with word worth chart and sentence expansion from Day I. Develop poetry, posters, cards, bulletin boards, etc..

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DAY THREE

1. Set up energy kits for students to make power plants or circuit boards. Obtain simple instructions for energy powered items from science labs, texts, magazines, or commercial kits. Set up simple diagrams on laminated cards for a beginning activity, with extended uses.
2. Trace the electrical energy path from Day I activity of source of water to fuse box in home. Attach types of energy to different stages of this path:

Kinetic Energy - Flowing Water
Mechanical Energy - Rotating in a Turbine
Electrical Energy - Generator

3. Review the stages of electrical energy:
 - a. Reservoir
 - b. Dam
 - c. Pipe leading from reservoir to power plant
 - d. Turbines
 - e. Generators
 - f. Transformers
 - g. Power Lines
 - h. House

Use the following activities with the above terms:

1. Put terms on cards and then place in working order.
2. Act out each term.
3. Write a story about the energy path.

DAY FOUR

1. Map the locations of any hydroelectric power facility in your state or neighboring states. Why were these locations chosen? Can we relate our lifestyles with the water resource in our area? What did our ancestors use for basic needs of life?
2. Compare electrical conveniences from home or school to those used 91 years ago. Use resources of catalogs, input from parents, encyclopedias, stories from ancestors, literature books, etc.
 - a. Suggested items: iron, pencil sharpener, toaster, popcorn popper, clock, calculator, heater, etc.

DAY FIVE

1. Continued exploration with energy kits.
2. Display and tell about any electrical creation as an individual or group.
3. Make a book about water as a source of electricity. Each student may contribute a page or work as a group on different books.

RESOURCES:

"Energizing Water", Project WET Montana notebook, Western Watercourse, Montana State University, Bozeman, MT, 1991. pp 77-80.

Water Wise: A Water Use Handbook, U.S. Dept. of the Interior, Bureau of Reclamation.

EVALUATION:

1. The student will relate the importance of electrical energy.
2. The student will describe the process of changing kinetic energy into electrical energy.
3. The student will show on a state or local map the hydroelectric power facilities in a given area.
4. The student will state the differences between features of 3 common electrical units now and 91 years ago.

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SCIENCE/MATH -

"Water as Energy"

TEACHER'S BACKGROUND INFORMATION:

The early uses of water as energy were to turn mills and as steam to run machines. Today waterfalls and dams create electrical energy. These waterfalls and dams must be within a few hundred miles of plants or cities since electricity cannot be carried great distances without waste. Only about one-eighth of the world's potential water power has been harnessed for use. The United States has more water power available than any other country. It only utilizes about one-fifth of its energy.

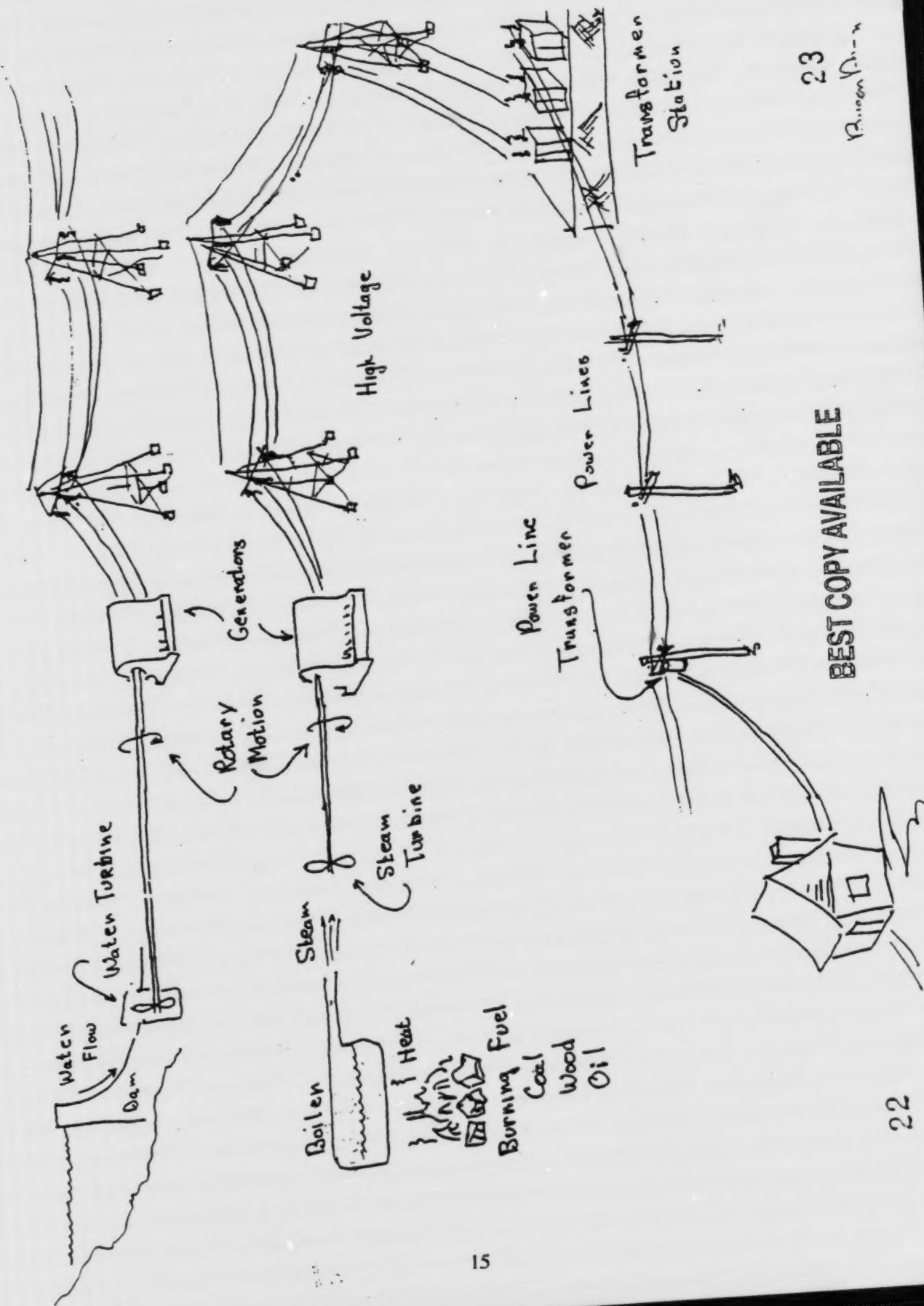
Hydroelectric power plants are found in our Western States. The word "hydro" means water. Hydroelectric power is electricity that comes from water. The water used for these plants are rapidly into plants and begins to turn huge wheel - like machines or water turbines thus creating electricity.

Most hydroelectric plants have their own facilities to store water so that there is a consistency in the flow throughout the year. An example of this is Hoover Dam which has facilities to store more than a year's supply of water and thus be able to operate at full capacity without using any water from the Colorado River.

The use of water power is limited by the natural distribution of water resources throughout the Earth. Usually the sites for hydroelectric plants are far from industrial centers. Even though hydroelectric power is efficient, clean, economical and apparently inexhaustible, it is not among the major types of electricity used at present. In the United States less than a fourth of electrical power generated is hydroelectric power.

Another use of water power in the experimental stage is the ebb and flow of the tides. To utilize this constant motion, a natural bay or basin is dammed and turbines are installed in the spaces in the dam. The water races through the turbines as the tide rises, flowing into the bay, and as it falls flowing back to the sea. This experimental project will probably come into greater use as the fuel supplies for thermal plants become more scarce.

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SCIENCE STANDARDS ADDRESSED IN ELECTRICITY UNIT –

Standard – Knows the forms energy takes, its transformations from one form to another, and its relationship to matter

Benchmarks –

Knows that energy comes in different forms, such as light, thermal, electrical, kinetic (motion), and sound, which can be changed from one form to another

Understands that whenever the amount of energy in one place or form diminishes, the amount in other places or forms increases by the same amount

Knows that temperature changes in a sample of matter are related to the loss or gain of thermal energy by the sample

Knows that energy changes involved in physical or chemical changes can be measured in the form of heat

Knows that energy can be harnessed to do work, which is represented by the quality of force applied to an object times the distance the object moves in the direction of the force

Understands what constitutes a system and how the idea of systems is used in different contexts

Benchmarks –

Knows that in mechanical and electrical systems, a single faulty or mismatched part may cause malfunctioning

Knows that thinking about things as systems means looking for how every part relates to the others

Knows that the output from one part of a system (which can include material, energy, or information) can become the input to other parts

Knows that any system is usually linked to other systems, both internally and externally

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED –

Physical Science

All Indian students should develop an understanding of how energy was transferred through the use of early Indian hunting tools, such as the act of throwing a spear with an atlatl.

Science and Technology

All Indian students should develop an understanding of the technological design process and how it was applied in the development of various tools and technologies employed by early American Indians, such as fish weirs, salmon spearing platforms, and road and building construction technologies.

History and Nature of Science

All Indian students should develop an understanding of ways in which reasoning, insight, energy, skill and creativity were demonstrated in the scientific achievements of early American Indians – architecture, tools, health and medicine.

OIL AND GAS

Oil and gas are other sources of energy that have contributed to more convenient lifestyles for American Indians. But they, too, have also contributed to destruction. Many tribes and tribal members have received money for oil and gas found on their lands, but it is usually not without a price. Land is destroyed and sometimes lives have been destroyed. The Osage Tribe in Oklahoma was particularly devastated by the discovery of oil on their lands.

LITERATURE FOR OIL AND GAS UNIT -

Old Man Coyote and the Rock and Tunka-Shila, Grandfather Rock, in *Keepers of the Earth* by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1988.

Morning Star, Black Sun, Northern Cheyenne Indians and America's Energy Crisis by Brent Ashabranner, Dodd, Mead, 1982.

ACTIVITIES FOR UNIT -

1. Have the students learn about oil and gas and its uses, read cultural materials and hear cultural perspectives relating to this topic, and observe impacts.
2. Have the students research the use of products from oil and gas in their area/reservation. What are the effects? Are there any negative effects?
3. Does the local tribe(s) have oil and gas resources? How has this affected the land and lives of the tribal members? List positive and negative effects.
4. Discuss the reasons for the fluctuation of oil and gas costs. What do oil and gas cost now? Why are these natural resources especially sought?
5. How is mathematics utilized in the oil and gas industry? Develop some problems and solve them.
6. Have the students develop position papers on what tribes should do in regard to their oil and gas resources.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University. Adapt these activities to meet your students' needs. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in *Keepers of the Earth*.

INTRODUCTION -

OIL AND GAS

CULTURAL OUTCOMES: II
SCIENCE OUTCOMES: II, III, IV, V, VI
MATH OUTCOMES: I, II, III, VI, VIII, IX

TIME FRAME: 6 weeks

CULTURAL LEARNING OBJECTIVES

Students will:

understand their relationship to Mother Earth

SCIENCE LEARNING OBJECTIVES

Students will:

gain an awareness of basic geological concepts

understand what energy is and how it's used

understand that the earth is made of layers of different types of materials.

understand that certain types of rock absorb and hold liquid better than others underground

know that water isn't found in underground lakes

identify places where water can gather

understand porosity and permeability

acquire information about oil pollution affecting water

know how leases are used

identify drilling practices used by companies

write about financial risk in drilling

able to verbally explain that gas coming out of solution can cause a gusher

understand that once the "gusher" pressure is lessened that oil must be pumped out of the ground

name three parts of an oil pump in a student's drawing or sculpture

explain how the method of oil transport affects the effort to deliver the oil

explain in writing a story how oil spills can be avoided

identify the benefits of pipeline transportation over other methods

use research skills to find information about the three methods of exploration for oil

have an idea of what type of instrument one uses and what they look like

research seismic-reflection exploration

use listening and note-taking skills

use hands-on skills and real life skills

understand that oil refining involves heating crude oil until it vaporizes into its component parts

understand that different solutions boil at different temperatures

learn that he can graph how component liquids boil at different temperatures.

MATH OBJECTIVES

Students will:

construct a time-line

use measurements

read a map to show understanding of the Federal Grid system

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SCIENCE/MATH -

"Energy and Its Uses"

TEACHER'S BACKGROUND INFORMATION:

Since the last quarter of the 19th Century, the petroleum industry has played a major role in the story of man's progress. From petroleum came gasoline, kerosene, fuel oils, lubricating oils and greases, wax, asphalt, and scores of other products.

The word petroleum is of Latin origin and means "rock oil". Scientists think that petroleum was formed from plants and animals that lived ages ago in and around warm seas that covered much of the earth. As the plants and animals died, they piled upon the sea bottom. In time millions of tons of sand and mud covered them. Under pressure, the mud and sand changed to rock. The plants and animals turned to a dark liquid trapped in the pores of the rocks. Upheavals of the earth's crust caused parts of the old sea floor to become dry land. Some of the liquid oozed to the surface of the earth where men first noticed it.

Crude petroleum, as it comes from the well is of little use. It must be refined. The basic refining process, distillation, is based on the fact that petroleum is a mixture of many solids, liquids, and gases. The chemist calls them hydrocarbons, for they are chemical compounds of carbon and hydrogen.

Petroleum research scientists have learned a great deal about juggling the molecules of oil. They can add or subtract atoms of hydrogen almost at will. The high octane gasoline for large modern airplanes is a very complex substance. It is made through use of the chemical processes these scientists have developed. Without this special fuel planes could not fly so far, so high, so fast, or carry so heavy a load as they do.

Gasoline, kerosene, lubricating oils, home heating oils, fuel oils for industry, bunker oils to drive great ships, and greases are not the only products from petroleum. There are hundreds of others. Your automobile may use a petroleum-base antifreeze in the winter. Its paint may be made of synthetic rubber. Special cutting and stamping oils have aided in the manufacture of the car's metal parts. Petroleum products are often used to make road-paving materials, roofing, candles, paraffin, waxed paper, carbon paper, salves, chemicals, cold cream, lotions, lipsticks, linoleum, T.N.T., fly sprays, moth repellents, dry-cleaning fluids, and alcohols. A few years ago there was usually some waste gas left over when oil was refined. Today everything can be used, even the smell. Odor made from oil is often put in gas used for cooking and heating, so people will be warned by their noses when there is a leak in a gas line.

STUDENT LEARNING ACTIVITIES:

A. Vocabulary:

- | | |
|-----------------|-----------------|
| 1. energy | 4. hydrocarbons |
| 2. petroleum | 5. carbon |
| 3. distillation | 6. hydrogen |
| | 7. chemist |

B. Activity:

1. Materials: butcher paper, pencils, markers, encyclopedias, and other resource materials.
2. Place students in cooperative learning groups of 3-5 and have them designate a leader and secretary.
3. Have students develop a list of at least 10 items or products that are made of petroleum.
4. Evaluation: Teacher observation of group dynamics and use of problem-solving strategies.

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SCIENCE/MATH -

"Where Is Oil Found?"

TEACHER'S BACKGROUND INFORMATION:

Petroleum is a liquid or gas consisting of organic molecules composed of hydrogen and carbon atoms.

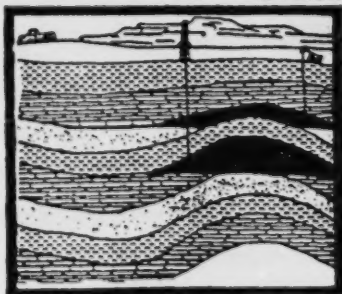
Most petroleum is formed from organic matter. Tiny particles of plant and animal's debris accumulated with mud deposited in stagnant bodies of water. The original organic material was mostly microscopic marine plants and animals that lived in open seas but much of it may have been derived from land plants and carried by streams to the site of deposition. Organic matter is preserved from oxidation and scavengers. It must be buried to considerable depths, usually more than 500 feet.

Beds of sedimentary rock in which the petroleum is formed are called the source rock. They are usually dark gray or black shale but limestone is a source under some conditions. Oil and natural gas are less dense than water and for all practical purposes are insoluble in water.

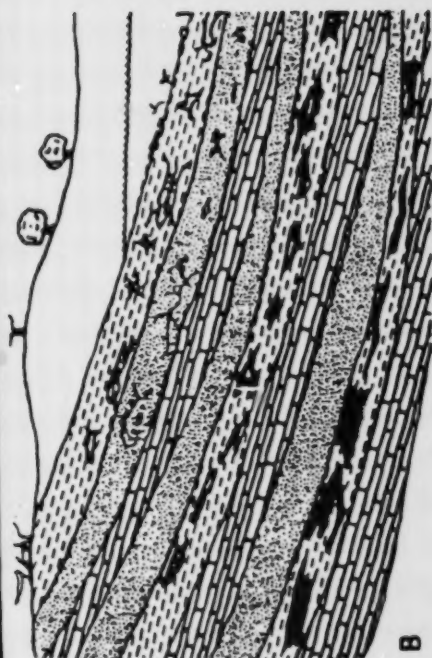
STUDENTS LEARNING ACTIVITIES:

A. Activity 1 - Where Oil is Found

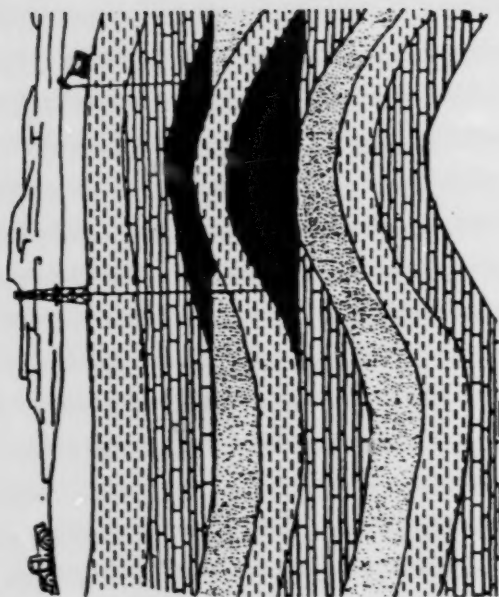
1. Place layers of clay and sand between two pieces of glass to show layers of earth.
2. Place a sponge filled with ink between the layers of clay and sand.
3. Place some water in a pocket under the ground.
4. Make sure you make sand levels.
5. Put a solid glass tube down through the layers, in or down, to tap into the layers of oil or water.
6. Students will pull the glass tube out and let the oil pollute the water table.
7. Evaluation:



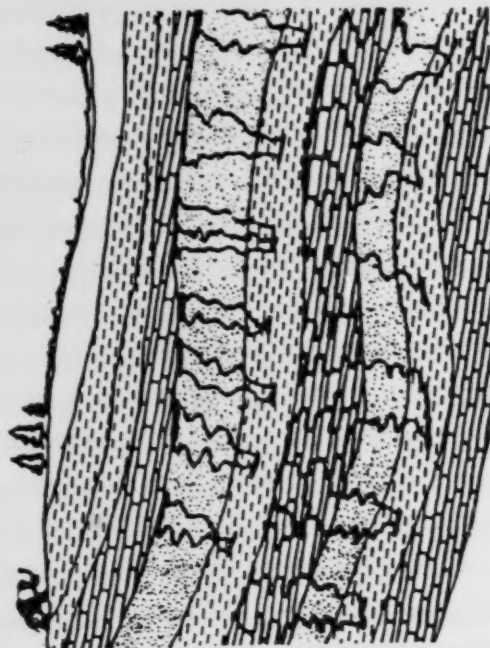
- a. Students will be given a handout that has a cross section of the earth and will point out where it is most likely to find oil and why.
- b. Students will be evaluated on the organization of the Thematic Unit Note Folders.
- c. Students will conduct a panel discussion on whether they are for or against drilling for oil.
- d. Activity quiz.
- e. Evaluate each students' models.



A



D



C

FIGURE 1—DIAGRAMS SHOWING THE ORIGIN OF PETROLEUM. A) Shows life existing in an ancient sea hundreds of millions of years ago and the death and burial of organic matter in the sediments. B) Millions of years later, life still exists in a shallow sea and the sediments have increased in thickness. The organic matter is being altered into petroleum. C) The sea no longer exists. Petroleum is migrating from the source rocks into porous rocks. D) The rocks have been folded forming an anticline. The petroleum is trapped at the crest of the anticline.

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SCIENCE/MATH -

"How Oil is Found"

TEACHER'S BACKGROUND INFORMATION:

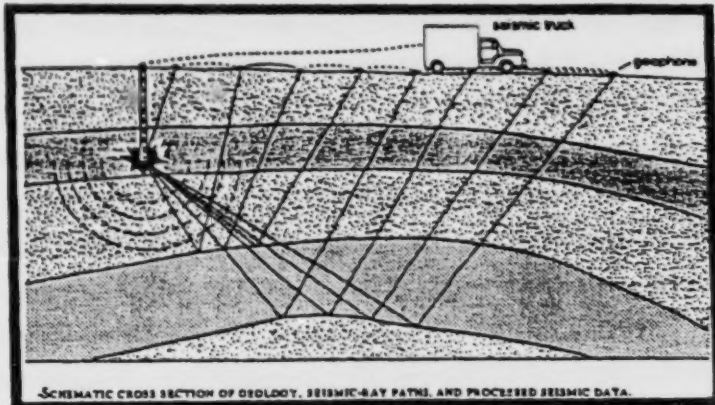
There are several means of exploring the earth by geophysical methods.

Each of these techniques exploits fundamental physical aspects of the earth's material, such as electrical, magnetic, acoustical or gravitational properties.

While these techniques do not allow detailed examination of the rock beneath us, they often enable geologists and geophysicists to infer the most likely properties of large volumes of rocks.

Seismic reflections, a powerful technique for underground exploration has been used for over 60 years. Waves are essentially sound waves that travel underground at velocities of 2 to 4 miles per second depending upon the type of rock through which they pass.

Seismic reflection techniques depend on the existence of distinct and abrupt sensor-velocity and/or mass density change in the subsurface. These changes in either density or velocity are known as acoustical contrast.



STUDENT LEARNING ACTIVITIES:

1. Activity

- A. Students will research the three types of geophysical exploration and see which method would cost the most and which one is the most cost efficient.
- B. Students will draw a diagram to illustrate the three methods.
- C. Students will research seismic-reflection exploration method and its cost and efficiency.
- D. Bring in a speaker to make a presentation on the

local area.

- E. Students will be given a list of words to listen for during a video presentation.
- F. Field trip. Students will visit an area where these various exploration methods are being used.

SCIENCE/MATH -

"Transportation"

TEACHER'S BACKGROUND INFORMATION:

Gas and oil can leave the well or refinery in a variety of ways. The most efficient is by pipeline. Less efficient ways include: tank trucks; barges; tankers; railroad cars. (See Activity A) Transporting oil or gas by pipeline is more efficient because other ways are more costly and use energy, i.e., gasoline, electricity. The cost of building a pipeline is high but operating one is much more inexpensive than other means.

When a pipeline reaches mountains the contents must be pumped. The pumping effort is lessened by a siphoning effect of the contents which have reached the lower area. (See Activity B)

Factors which increase the cost of transportation by means other than pipelines involve public as well as oil/gas company resources. When oil is transported by truck the company must pay for gasoline to operate the truck and the pump used to remove the oil from tanks. In addition, the cost of truck and oil well road maintenance cuts into the company's profits. The weight of oil trucks damage public road surfaces, resulting in higher taxes for local citizens. There is also the cost of environmental clean up when a tank truck is involved in an accident which causes its contents to spill. (See Activity C)

Trucks are also less efficient for transporting natural gas for the same reasons as oil, and one more important reason. Energy must be expended to condense the gas for tank truck transport.

Barges and tankers use oil products to operate and put waterways and coastlines at risk of oil spills. Transportation by railroad also uses more energy than pipelines and can pollute areas if the tank cars spill the oil in a mishap or because of human error.

STUDENT LEARNING ACTIVITIES:

A. Activity:

1. Materials: 1 watch, 1 soft rope, 1 meter or yardstick, one-30 ft. length of garden hose, 10 one-gallon buckets, water supply, 1 funnel, 1 roll of tape, 2 very large, waterproof containers of equal volume, and 2 cups.

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2. Divide the class into two groups or "oil or gas companies." Allow them to choose among the following roles: Recorder/level checker; Dipper; carrier (bucket only group); funnel holder (hose group). NOTE: This activity is best performed out of doors.
3. Extend the hose from the water source and place the large containers at the end. Put the end of the hose into a container. Fasten the funnel to the other end of the hose with tape and have the funnel holder hold it slightly higher than the other end which is the outlet. Stretch the rope from the other container to the water source--do not make it straight.
4. Have the hose group empty water buckets into the hose to fill up the large container. The Dipper removes one cup of water for every three buckets poured into the funnel to simulate the money, effort and energy required to pump a real pipeline. Pour cups into an extra bucket. The recorder keeps a count of each bucket emptied into the hose.
5. The bucket only group operates as a bucket brigade. Simulating transportation by trucks, rail road, tank cars, and water craft. The bucket carriers carry the buckets from the water source to fill the large container. When they are doing so, have them walk on a rope, placing each foot on it.
6. The Dipper pours the water into a bucket. When he or she has filled a bucket another of the groups' buckets must be used.
7. The Dipper removes 2 cups from each bucket to demonstrate oil money losses in the form of transportation. The monetary losses include the wages for truck drivers, mechanics and other employees as well as energy required to transport the oil and/or gas. The Recorder should keep track of the buckets of water carried to the large container.
8. Ask both groups who is getting tired, expending more effort.

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9. Stop some of the bucket carriers to demonstrate a traffic tie-up or environmental accident.
10. The instructor may wait until a large container is filled. Check the class' breathing and pulse to gauge the effort required, compare each group.
11. Have the Recorders/Level checkers measure the depth of the water in the containers while dippers use cups to measure the volume of water they removed. Record all information.
12. As a class measure the volume of the water in the containers.
13. Ask students to compare the amounts and the effort/cost to reach those amounts.
14. Have students write ratios/fractions for water in containers and cost resources in buckets.
15. Ask students what the basic factors affecting the amounts in the large cost containers are: time, method, volume of container, hose.

B. Activity 2:

1. Ask the children, "Can water pull water, and if so, how?"
2. Narrow their thinking to the materials for Activity 1, guiding them to the garden hose. Demonstrate the siphon effect useful in pipelines.
3. To teach the children to siphon, follow this procedure: Submerge the hose in a container of water until it is fully flooded. Place your hand over one end to keep the water inside the hose from seeking its own level, and lift it out of the container. Guide it to a bucket placed lower than the bottom of the first container. The siphoned water will pull more water into the lower bucket. Involve students in siphoning and ask them what is happening, how it works and how it helps get oil through a pipeline.

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C.

1. Conduct a guided imagery exercise, following the route of oil and gas. Involve both pipelines and tankers. At one point have the pipeline cross a river. Describe the cleanliness of the river and the animals including Otters. "Put" the oil in a tanker which experiences a mishap, spilling oil.
2. Ask the students to predict what will happen next. After they have given their opinion, chorally read "An Otter Tragedy," and discuss the fate of otters after the Exxon Valdez oil spill.
3. Have the students create a vocabulary stock pile of both oil and wildlife words.
4. Have the students write and illustrate their own path for oil from the well to the container, without any accidents.

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SCIENCE/MATH -

"Refining Oil"

TEACHER'S BACKGROUND INFORMATION:

Refining oil is the process of making unusable crude oil into many useable products. Of the ten methods of refining oil, fractional distillation is most common: the fractions (or components) of oil boil at different temperatures. To separate the fractions, oil is piped through a furnace and discharged into a 120-foot tall fractionating tower. Here all but the heaviest fractions flash into vapor. As the vapor rises various components condense at certain temperatures. Vapors having the highest boiling point, such as asphalt, condense first. Above asphalt heating oils and lubricating oils condense. At the top of the tower gasoline and vapors are collected. Gasoline accounts for 45% of all refined crude oil.

STUDENT LEARNING ACTIVITIES:

1. Activity 1

- A. Making a model of a refinery is a hands-on activity that will enable your students to visualize how a refinery works.
- B. Materials:
 - 1. Drinking straws (preferably flexible), empty half-pint size milk cartons, paper towel tubes, construction paper, tag board, scissors, glue, color markers.
- C. Procedure:
 - 1. Seal the empty milk carton and cover it with construction paper. Poke holes on opposite sides and push a straw through. Glue the mild carton on the tag board. Stand the paper towel tube nearby and make a small hole towards the bottom enabling the straw from the mild carton to enter. On the other side of the tube make 6 small holes. From these holes extend straws out 2 inches, then bend down to the tag board. Color as desired.
- D. Performance appraisal:
 - 1. Judge the student's refineries. Have they been properly constructed? Ask the student to explain how the oil refinery works by pointing to parts of his model

and explaining how they work. Does he mention that the various components of oil condense at certain temperatures?

2. Activity 2

A. Materials:

1. 500 ml narrow neck glass beaker, 200 ml tap water, 200 ml isopropyl alcohol, rubber stopper with two holes, heat source, long thermometer, glass condensation tube, and two small collection beakers.
2. Heating the water: Put 200 ml of tap water in the beaker, seal it with the rubber stopper and place the thermometer in one of the holes. Heat the water and note the temperature at which water vapor evaporates through the open hole. It will be 212 degrees F.
3. Heating the alcohol: Repeat step one using isopropyl alcohol instead of tap water. The temperature at which the alcohol evaporates will be lower, at 175 degrees F.
4. Heating the solution: Combine 200 ml isopropyl and 200 ml tap water in the glass beaker. Stir gently. After capping the glass beaker with the rubber stopper insert the thermometer in one hole, the glass condensation tube in the other.

B. Graphing the results:

1. Label the horizontal axis "time" and indicate 30 one-minute divisions. Label the vertical axis "temperature" and mark off 5 degree increments of temperature, up to 250 degrees F. Plot the temperatures from one to thirty minutes and draw a line connecting the points or 175 degrees F. and a second at 212 degrees F. Each plateau represent the temperature at which each liquid evaporates.
2. Place the solution over the heat source and begin recording the temperature every 60 seconds.
3. Closely examine the thermometer when nearly half the solution has evaporated. At this point the alcohol, which boils at a lower temperature than water, has finished evaporating. When the temperature starts to rise, replace the

collecting beaker. Continue heating until the solution (now just water) evaporates.

C. Performance appraisal:

1. Have the students set up the experiment properly? Do they understand the solution being boiled is being distilled into its two components? Are their graphs correct?

SCIENCE/MATH -

"Culminating Activity/Evaluation"

- A. Start with a panel discussion on the pros and cons of oil drilling on the Reservation.
- B. Next put all the opinions that were discussed by the students on a separate board, to be left until the activity is done.
- C. Put some content words and topics on the board.
- D. Have each student follow the four steps listed below:
 1. Step 1
 - a. Students are to read the map to find where oil would most likely be found.
 - b. Students will lease the landform from the Tribe or individual for testing.
 - c. Student will demonstrate an understanding of the process of testing for oil.
 2. Step 2
 - a. Students will go through the steps in extracting the oil.
 - b. Students will chart on a graph how much oil is being extracted from the ground.
 3. Step 3
 - a. Students will demonstrate an understanding of the process transportation of the oil to the refinery.
 - b. Students will demonstrate an understanding of the cost of transportation of the oil to the refinery.
 4. Step 4
 - a. Students will describe how to refine the oil and the making of various products.
 - b. Students will make a list of products made from oil.

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SCIENCE STANDARDS ADDRESSED IN OIL AND GAS UNIT –

Standard – Understands that scientific inquiry works in particular ways

Benchmarks –

Understands that preventing the influence of outside factors is often difficult, and that research designs should be examined for their presence

Standard – Knows basic concepts about the earth

Benchmarks –

Knows that some minerals are scarce and some are abundant, but the ability to recover minerals is just as important as their abundance; as minerals are depleted, obtaining them becomes more costly, leading to substitutes or more recycling, which also adds costs

Standard – Understands the processes that shape the surface of the earth and the relation of the surface of the earth to the living environment

Benchmarks –

Knows that sediments of sand and dead organisms are gradually buried, subjected to great pressure from the weight of the overlying materials, and eventually may be turned into rock again

Standard – Understands the cycling of matter and flow of energy through the living environment

Benchmarks –

Knows how matter is cycled and recycled within ecosystems, yet the total amount of matter remains constant, even though its form and location change; that the chemical elements that make up the molecules of living things pass through the food web and are combined and recombined in different ways

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED IN UNIT –

Life Science

All Indian students should develop an understanding of concepts of nature's diversity, codependency and the intricate balance between natural forces and how they are reflected in traditional Indian philosophies and symbols, such as the Medicine Wheel.

Science in Personal and Social Perspectives

All Indian students should develop an understanding of how environmental degradation may be occurring in their communities and/or on reservation lands.

Physical Science

All Indian students should develop an understanding of the principle of changes in properties in materials, applied in the daily lives of early Indians, such as evidenced in the preparation of wood splints for basketry, the production of glue from the hooves of a deer, and the preparation of natural dyes.

USE OF PLANTS

In North America, Native people utilized over 2,000 species of plants for food. At least 19 of these plants had to be cultivated, such as corn, beans, squash, tomatoes, avocados and peppers. Horticultural techniques are credited by scientists to have been more advanced in the Americas than they were in Europe. For example, 250 different kinds of potatoes were planted by Inca farmers; only one of which, the "super potato," was used in Ireland.

Indian people learned that by planting beans and corn (and sometimes squash) together, the crops would thereby be larger and healthier. This is due to the fact that the nitrogen, needed by corn, was generated by the beans' roots. Corn, beans and squash are sometimes referred to as the "three sisters." The use of fish as fertilizer by burying it in the soil also brought about improvement in crop yield. When Indian people rotated crops, they found that they could improve the quality and/or size of plants. In addition wild plants such as burdock, dandelion, milkweed, mushrooms, berries, wild rice and nuts were also used for food.

Plants were used for many different purposes. In fact, the same plant could be used in different ways. In the corn plant, tubes from the stalk were used for medicine; husks for kindling and as tapers for carrying fire; husks for weaving mats, baskets and moccasins; corn silk for medicine; corn cobs for smoking hides; dried corn kernels for beads and decorations; green corn leaves for bandages; and, of course, corn is a very nutritious "high yield" food.

- ORBIS Associates, Washington, DC

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ACTIVITIES FOR USE OF PLANTS UNIT -

1. Have the students learn about plants and their uses, read cultural materials and hear cultural perspectives relating to this topic, and observe local plants.
2. Have the students research the use of plants by the local tribe(s) in the past and in the present. What science is involved? What math is involved?
3. What methods are used by local farmers to increase quality and quantity of crop yield today? Are there any local people who still utilize traditional methods of growing plants? What are those methods?
4. How was the diet of Indian people of the past healthier than it is today?
5. Have the students develop a presentation with visuals for the school and community members based on their research.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University. Adapt these activities to meet your students' needs. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in the *Keepers* books.

SCIENCE --

"SALON IN THE DESERT"

CULTURAL OUTCOMES:
SCIENCE OUTCOME:

X, II
II

CULTURAL OBJECTIVE:

Students will relate the traditional way of looking at the natural world through a comparison of traditional yucca soap versus non-native lye soap.

SCIENCE OBJECTIVES:

Student will:

know laboratory safety rules

know and use scientific measurement techniques

conduct a scientific experiment.

TEACHER'S BACKGROUND INFORMATION:

The Navajo word for yucca is Ts'a' 'aszi.

Yucca is the common name for about 40 species of the lily family. It grows in warm regions of the United States from California to South Dakota, from Montana and Kansas to Maryland and Tennessee, and from Florida and Louisiana to Texas, New Mexico and Arizona.

There are two general types of yucca. One with fleshy, moist fruit and the other with dry fruit, both at maturity. They produce big flattish, black, wind carried seeds in abundance that are freed by splitting of the ripened ovaries. The leaves may be a broad leaf or a narrow leaf. Plants may be stemless with large clusters of pointed leaves rising directly from the soil, or they may produce woody trunks that reach 40 feet. They produce white or violet flowers which open up during the night to emit scents that in some cases attract only particular species of moth required for pollination. Some moths lay their eggs inside the flowers. The moth larvae feed on the new yucca seeds.

Yucca fibers were used for sandals, baskets matting, fabrics brushes and fishing. Also crushed yucca fibers were used to ease many illness, like colds, wounds and rheumatism. As a food, both flowers and fruits were eaten fresh or when cooked.

Spiritual use of yucca soap is used during a girl's beginning of womanhood ceremony. A purification process is conducted. It is suggested that an elder or community member is used for a traditional explanation.

The Navajo word for soap is ta'la'ghosh.

A soap is a substance that cleans soiled surfaces. Soaps are produced in the forms of bars, flakes, liquids and tablets. Soaps contain a basic cleaning agent called a surfactant or surface active agent. Surfactants are chemical molecules that attract themselves to dirt particles in soiled materials. The molecules pull these particles out of the material or surface and hold them in the water until they are rinsed away. The surfactant in yucca is called saponin.

A surfactant has two distinct parts with different characteristics. One part of each surfactant molecule is hydrophilic (water loving) and the other is hydrophobic (water hating). The hydrophobic part attaches itself to any surface other than water. At the same time hydrophilic parts pull away from the surface and toward the water.

After the dirt particles are in the water, a thin layer of surfactant molecules around the surface prevent the dirt from settling on the washed surface again. The dirt particles remain suspended in the water until they are rinsed away.

STUDENT LEARNING ACTIVITIES:

1. **Make native yucca soap.**

With an elder from the tribe, collect the roots of a yucca according to his or her directions. It is at this time that an offering is given for the taking of the yucca. Prepare the soap traditionally or use the procedure below.

To prepare the yucca soap solution, pound the yucca root into fibrous masses of pulp. In a beaker, pour warm water over the pulp and let it soak for a least 10 minutes. Filter the soap through a loosely meshed material.

2. Make lye soap.

Place 30 grams of lard (animal fat) in a beaker. Add 100 mL of a 20 percent solution of lye.

CAUTION: Lye is a caustic soda. Avoid splattering. Lye can severely damage skin if it comes in contact. If splashed in eyes, lye solutions can cause blindness in just a few seconds. For these reasons special care should be taken when handling products that contain lye. Wear protective goggles and clothing. Boil gently for about 15 minutes. Let the mixture stand for a few minutes and then add 5 grams of table salt. Because soap is insoluble in salt water, it rises to the top of the beaker. Skim off the soap, press it into a cake, and let it dry.

Place 6 test tubes in one rack and fill each tube with 10mL of the yucca soap solution. Label the rack with your name and what type of solution is in the tubes. Repeat the same procedure with the lye soap with water solution.

Determine the pH of each solution by dipping the pH paper into any one tube of each of the four sets. Record on your observation chart.

In the first tube of each rack, pour 3mL of CaCl_2 (calcium chloride) solution. Observe and describe the reaction on the appropriate space on your chart. Place a stopper in the tube; shake it and again describe the reaction in your chart.

Repeat the procedure above using the second test tube in each rack; except this time use the FeCl_3 (ferric chloride) solution. Record.

In all of the test tubes use the same procedure as in before. In the third set of test tubes repeat the procedure with MgCl_2 (magnesium chloride). In the fourth set of test tubes use the phenolphthalein solution. In the fifth test tubes use 4 drops of mineral oil. In the sixth test tubes use one small drop of India ink. Try to drop the ink so it does not run down the sides. Here, in the sixth test tubes, after shaking, approximate by percentage how much of the India ink remains in the foam fraction and how much remains in the solution. Record in the appropriate space on your data chart.

Participate in the class discussion which will follow this experiment.

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EVALUATION:

On the basis of your observations and results of this experiment, compare the similarities and differences of yucca soap with the other soap solutions. Support your findings with specific examples from your data.

Which of the two cleansing agents would work in hard water? Based on your observations, why do you think this is so.

Hypothesize some of the general chemical formula or configurations of yucca soap based on your knowledge of the chemical of lye soap.

When people say that the use of a soap is a modern invention, do you agree or disagree? Why?

GOING FURTHER:

Find out if there are other local plants which contain saponin.

Suggest that students wash their hair with yucca soap.

Try to create ways to preserve yucca soap, since it easily spoils.

RESOURCES:

Outdoor World Science and Mathematics Project. Indians are the First American Scientists, 1984

Hands on Minds on - Science Activity for Children, American Indian Science and Engineering Society, 1990

DEVELOPED BY:

Frances Wabaunsee

MATH AND SCIENCE --

"SPRING COMES, PLANTS DYE"

CULTURAL OUTCOMES:	II, X
MATH OUTCOME:	IV
SCIENCE OUTCOME:	III

CULTURAL OBJECTIVE:

Students will expand their knowledge of relationships between Native Americans and the world around them, with an emphasis on the strong interdependence of man and nature that Native people have long recognized and valued.

MATH OBJECTIVES:

Students will:

be able to apply a working knowledge of perimeter, and area in problem-solving applications

create a table, chart, or diagram to interpret a given set of data.

SCIENCE OBJECTIVES:

Students will:

list three or more relationships between humans, plants, animals, and their environment

be able to use classification systems

conduct a scientific experiment

be able to analyze, research data, and draw conclusions

be able to state cell characteristics and processes

know and use scientific (metric) measurement techniques.

TEACHER'S BACKGROUND INFORMATION:

This unit will introduce students to the techniques of dyeing wool with plants used by Native Americans. It will also teach some of underlying scientific concepts of plant use. Traditional Native Americans possess detailed knowledge regarding the habitat, ecological communities, distribution, seasonal variation, and history of plant species of their land. Many scientists testify as to the value for natural science of this traditional knowledge, much of which has practical application.

STUDENT LEARNING ACTIVITIES:

MATH

1. Find the perimeter of a large rounded leaf by using a string to outline the outside of the leaf. Stretch the string on a metric ruler and record.
2. Find the area of the leaf by drawing a 1 cm grid over the entire leaf, and counting each square centimeter.
3. Measure the length and width of each leaf. Make a graph to compare the findings for each leaf measured.
4. Determine the height of a tree, by selecting a student of known height to stand with his/her back against the tree. The other students will stand away from the tree and estimate how many student heights it takes to reach the top of the tree.

Another way of finding the height of a tree is to have a student stand near a tree. Measure the student's height and shadow length. Measure the tree's shadow. Set up a proportion to determine the height of the tree.

$$\frac{\text{Student shadow length}}{\text{Student height}} = \frac{\text{Tree shadow length}}{\text{Tree height (unknown)}}$$

5. Find the approximate dollar value of the tree by obtaining cost figures from a lumber company. For example, if the cost of 100 board feet of lumber is \$2 per board foot, find the dollar value of the tree.

6. Determine the volume of a tree.
 - a. Measure the circumference, in inches, of the tree at a point about four feet from the ground. This point is called "breast height."
 - b. Calculate, in inches, the diameter of the tree. Record the diameter. Obtain the volume in board feet from the table. (Pi, written π , is approximately equal to 3.1416.)

$$\text{Diameter} = \frac{\text{circumference}}{\pi}$$

7. Ask students to research and write about the quantity of lumber harvested in Arizona and on the Navajo Reservation each year. What is the value of this lumber?

SCIENCE

1. Have students define the following vocabulary terms:

cell	guard cells	chloroplast
cell membrane	stomata	guard cells
cell wall	vacuole	mitochondria
nucleus	lysosome	golgi complex
protoplasm	epidermis	habitat
cytoplasm	mitochondria	absorption
chromatography	pigment	adaptation
bark	xylem	mordant
dendrochronology	ethnobotany	cambium
phloem	cortex	climate

2. Read and discuss Native American stories and legends, such as "The Origin of Corn." Ask students to create and write a legend of their own, centered around plants, then construct their own illustrated book.
3. Collect and classify common plants around the school and make a plant journal to keep their leaf samples and activities. Each leaf should be pressed and taped or glued inside the journal. Identification cards will contain the following information for each plant: common name, Indian name, scientific name (genus and species), date collected, and the location found.

Review diagrams and examples of the following: leaf veinations, margins, surfaces and leaf arrangements.

4. Ask students to observe, study, record information and draw the following for each specimen collected: leaf venation, margin, surface, shape, and leaf arrangement.
5. Make a comparison of similarities and differences between two or more leaves. Their patterns of symmetry, venation, margins, surfaces and leaf arrangements.
6. Construct model plant and animal cells, label each part and put inside their plant journals.
7. Use a microscope to observe and study a plant cell. Examples: onion skin, lettuce, and elodea leaf (to be found at a pet store). Observe the stomatae and guard cells of common tree leaves such as the Elm or Cottonwood. Use the outermost tip of the leaf and view the underneath side to see them. Draw and label the different structures you observe in your plant journal.
8. Make a word search puzzle using all of the vocabulary words.
9. Have students work cooperatively to perform a frybread pizza cell experiment. Students will make dough and cook a small frybread pizza. Follow the dough recipe provided below:

4 cups	flour
2 tablespoons	baking powder
1 teaspoon	salt
1/2 cup	powered milk

Mix ingredients well. Add enough warm water until the mixture is smooth and soft. Set dough for 30 minutes. Shape dough into round ball. Flatten with hands to a size desired. Place into hot grease and cook each side until golden brown for each side. Students can use their frybread pizza to represent a cell with the following correspondence:

Pizza	Cell
frybread	cell wall
pizza sauce	cytoplasm
pepperoni	nucleus
green pepper	chloroplast
olives	vacuoles
cheese	protoplasm
mushroom	golgi complex
pineapple	lysosome
green onions	mitochondria

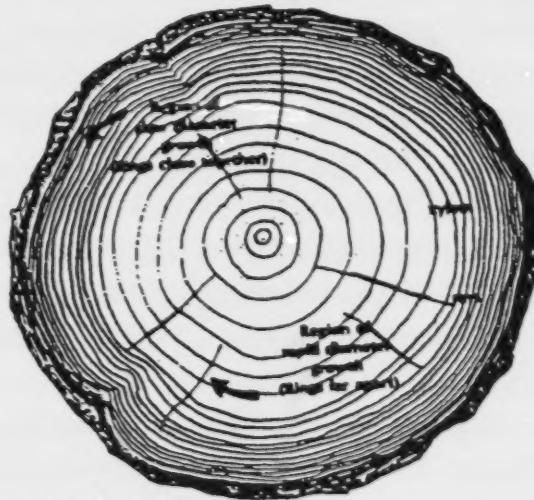
Place frybread pizza inside a toaster oven until baked. Draw your pizza, label it with the correct cell part and enjoy.

10. Each group will submit a paper on a plant. Write about its characteristics, Native American uses, adaptation, seed dispersal, classification, and life cycle. An oral report will also be presented by each group, using their plant collection.
11. Make a large descriptive poster for each plant collected. Example: Draw and color plant picture, uses, parts and functions, origin, habitat, Indian and scientific names.
12. Use the process of chromatography to help students understand the role of plant pigments in Native American wool dyeing.
 - a. Measure out 5 strips of Whitman filter paper and cut to directed size of 20 cm long, and 3 cm wide. Cut a V shape at one end.
 - b. Place only one strip inside a test tube or jar at a time and cover. Use water or rubbing alcohol.
 - c. Observe and record the movement of colors on the paper as the chemical dyes undergo chromatography.
 - d. Measure the distance in centimeters each color traveled. Chart and graph the information for each color.
13. Native Americans use plants to obtain colors to dye their wool. Show the class examples of various plants that have been used to provide dyed colors in wool.
 - a. Have students collect 3 to 5 specific plants for dying wool. Match each plant to the correct color of dye.
 - b. Ask students to bring 1 or 2 ounces of sheep wool, if available. Wash the wool in mild soap, rinse and follow the mordanting recipe:

(112g)	Alum
(25g)	Cream of tartar
(0.5L)	Boiling water
(0.45kg)	100% wool

Dissolve the alum and cream of tartar in boiling water. Add to a pot of warm water large enough to allow the water to cover the wool. Put the wool in the water and cover. Bring to a simmer for 1 hour. Let wool cool in the mordant bath overnight. Rinse the wool.

- c. Have students prepare plant materials as stated in the "Navajo Native Dyes" book into small pieces. Cover with water and boil for 1 hour. Strain out the plant material. Add water to make a 4 liter dye bath. Gently submerge the wool in the dye bath. Follow the directions in "Navajo Native Dyes." Rinse wool in cool water and dry in dark place. Students may weave a small Navajo rug with the wool they have dyed.
 - d. Research and write about the history of natural dyes. Invite a Native American elder to come and speak to the class about Navajo rug weaving.
14. Use a small log to identify annual tree rings for age and to predict future weather cycles by observing the patterns of growth in the rings.
- a. Have students sandpaper the end of their logs to help identify the annual rings. Sand until the rings are clearly visible and distinct. Students will count and record the number of rings to determine the age of their log. Begin at the outermost ring and count towards the center.
 - b. Students will discover their tree's weather history, through close observation and measuring the width and separation of rings to the nearest millimeter. Using past weather patterns gleaned from old newspapers, ask students to predict future weather patterns and produce a class chart.
 - c. Students can chart their life on the tree ring. Write their name next to the year they were born and compare their age to the tree.



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EVALUATION ACTIVITIES:

1. Students should have collected and identified several plants. Evaluate the number collected and ability to identify native plants.
2. Evaluate each student's completed wool dyeing project.
3. Check students' drawings for detail and accuracy.
4. Discuss and check lab sheets.
5. Test knowledge of vocabulary terms by a written quiz and short essay.
6. Have students explain the methods they used to determine perimeter, area, height and dollar value of a tree. Check the accuracy of their measurements.

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"Kool-Aid Kaper Chromatographer." The AIMS Foundation . 1986.

Nichaus, Theodore. Wildflowers: Peterson Field Guide. Boston: Houghton Mifflin Co., 1984.

Science Teaching Resource Unit. MASTER PROJECT. Lawrence, Kansas: University of Kansas, Fall, 1988.

Tamppari, Ray. Accent Arizona. Tucson, Arizona: Arizona Alliance for Math Science and Technology Education, 1988.

DEVELOPED BY:

Greg Mooring

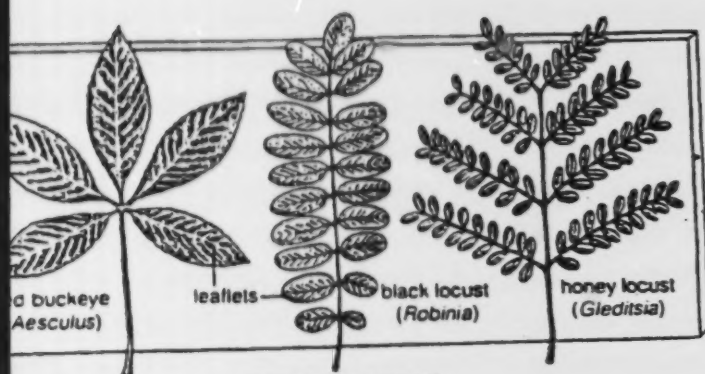
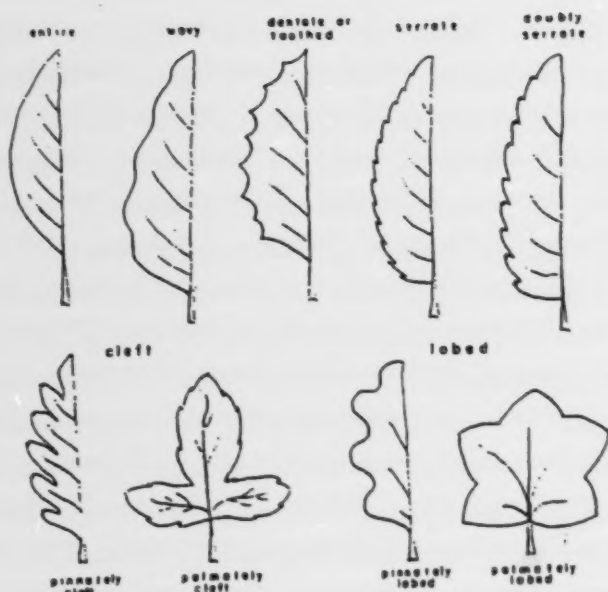
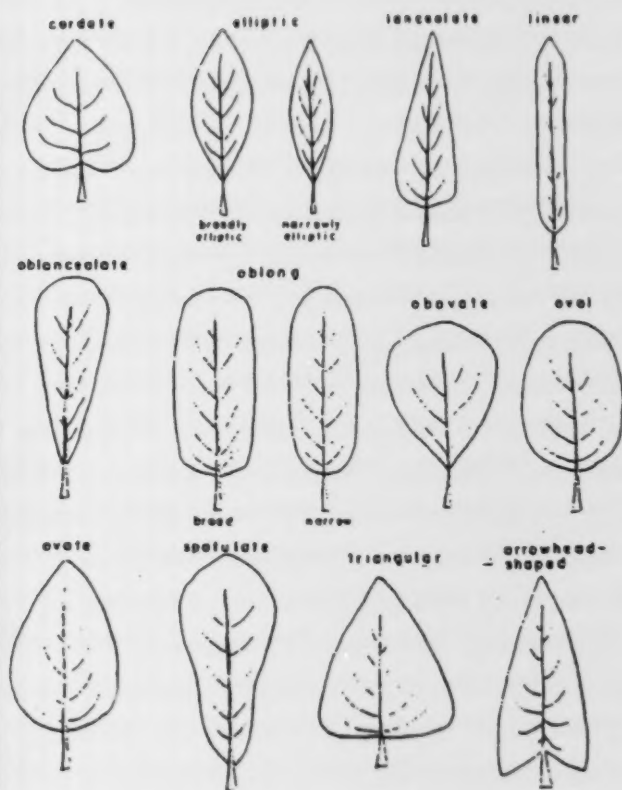
THE ORIGIN OF CORN

(Wabanaki)

A long time ago, when Indians were first made, one man lived alone, far, far from any others. He didn't have any fire and lived on roots, bark, and nuts. This Indian became very lonesome. He was tired of digging roots. He lost his appetite, and after a while just lay dreaming in the sunshine.

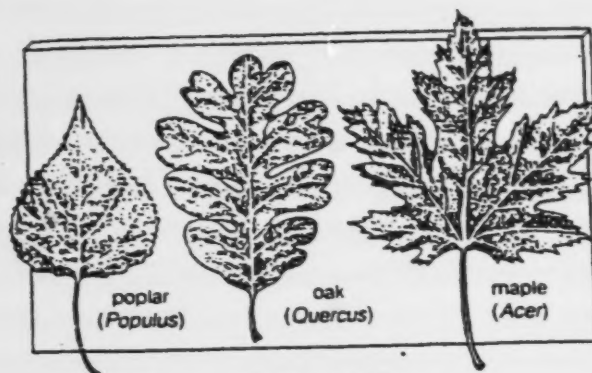
After he had been sleeping several days, he awoke and saw something standing near. At first, he was quite scared. But when it spoke, his heart became glad, for it was a beautiful woman with long light hair. She was not like any Indian. He wanted her to try to approach her but she seemed to go further away. He sang to her of his loneliness and begged her not to leave him. At last she told him that if he would do just what she said, he would always have her with him. He promised her he would.

She led him to a spot where there was very dry grass. Then she told him to get two very dry sticks and to rub them together quickly. Soon a spark flew out and caught on the grass. Quick as an arrow the ground was completely burned over. Then the beautiful girl said, "When the sun sets, take me by the hair and drag me over the burned ground." The Indian didn't want to do this, but she told him that wherever he dragged her something like grass would spring up, and between the leaves he would be able to see her hair. When this happened, the seeds would be ready for him to use. He did what she asked, and to this day when the Indians see the silk on the cornstalks they know the girl has not forgotten them.



COMPOUND LEAVES

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SIMPLE LEAVES

SCIENCE STANDARDS ADDRESSED IN USE OF PLANTS UNIT –

Standard – Understands the main individual, social, ethical and institutional aspects of science

Benchmarks –

Understands that scientists are employed in education, government, business, and industry; they work in offices, classrooms, farms, factories, and in field settings
Understands the value of computers for speeding up and extending the ability to store, compile, analyze and share data; to prepare research reports, and share ideas with others all over the world

Standard – Knows about the diversity and unity that characterize life

Benchmarks –

Knows that the major categories of living organisms are plants, which get their energy directly from sunlight; animals, which consume energy-rich foods; and microorganisms, some kinds of which cannot be neatly classified as either plants or animals

Standard – Knows the general structure and functions of cells in organisms

Benchmarks –

Knows that all living things are composed of cells from one to many millions: cells are the smallest unit of life that can reproduce themselves
Knows that cells contain a common set of observable structures (membrane, nucleus and other organelles) that have different functions, including conversion and use of energy, protection and reproduction

Standard – Understands basic concepts about the structure of matter

Benchmarks –

Knows that an enormous variety of biological, chemical, and physical phenomena can be explained by changes in arrangement and motion of atoms and molecules

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED –

Science as Inquiry

Indian students should develop the ability to articulate examples of scientific inquiry necessary to develop and improve technologies employed by early American Indians such as corn agriculture.

Physical Science

Indian students should develop an understanding of the principle of changes of properties in materials applied in the daily activities of early Indians, such as evidenced in the preparation of wood splints for basketry and the preparation of natural dyes.

Life Science

Indian students should develop an understanding of the ecosystems knowledge evident in the American Indian agricultural practices of companion planting and fertilization.

MAN, ANIMALS AND PLANTS

In the past, animals were important to Indian people for food and clothing purposes and sometimes for shelter. Animal parts were also used for tools and utensils. Animals were, and are, a vital part of the cycle of life.

When the Indian people killed a buffalo, they used every part of it. They did not waste any part. The respect for the buffalo and for the land he grazed on was very important. Without that respect the buffalo would not have been able to thrive.

Until the middle of the 19th century, the lives of the Plains Indians were totally interwoven with the life of the migrating buffalo herds. The buffalo provided a wonderful assortment of gifts for people to use. Some of the gifts were food, clothing, shelter, musical instruments, games, tools and weapons, cooking pots, and carrying bags.

Before Indians got horses, the Plains tribes followed the buffalo by foot. They used dogs to carry their goods. The horse changed the way that Plains tribes hunted buffalo. They rode these sturdy horses on buffalo hunts and during battle. Indians loved their horses and took good care of them.

Today many Indian people are ranchers and use horses and dogs to help them in the raising of cattle or sheep. Some raise buffalo. The cattle, sheep and buffalo provide a livelihood for the ranchers who have learned how to best take care of their animals and to care of the land and plants necessary to raise them. They recognize the importance of all animals and plants in the natural system and view the earth as a mother that gives life to all things.

LITERATURE FOR THE MAN, ANIMALS AND PLANTS UNIT –

Passing of the Buffalo in Keepers of the Animals by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1997. **Kiowa**

Buffalo Days by Diane Hoyt-Goldsmith, Holiday House, 1997. **Crow**

Thunder Bear and Ko: The Buffalo Nation and **Nambe Pueblo** by Susan Hazen-Hammond.

The White Buffalo Calf Woman and the Sacred Pipe in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1988. **Lakota**

Hokshila and the Red Buffalo by Moses Nelson Big Brow (**Indian Author**). **Lakota**

Buffalo by Tiffany Midge (**Indian Author**), Scholastic Books. Stories from **Seneca, Omaha, Ojibwa, Wichita, Apache, Kiowa**

The Horse and the Dog in **Hidatsa** Culture by Gilbert Wilson, J. & L. Reprint Co.
Vol 10.

The Spotted Horse by Henry Tall Bull (**Indian Author**), Montana Council for Indian Education.

Blue Canyon Horse by Ann Nolan Clark, Viking, 1954. **Southwest**

How Wild Horses Were Captured by Montana Council for Indian Education, Billings.

Out of the Saddle: Native American Horsemanship by G. Pony Boy (**Indian Author**).

American Indians as Cowboys by Clifford E. Trafzer.

What's the Most Beautiful Thing You Know about Horses by Van Camp.

After Columbus: The Horse's Return to America by Herman Viola, 1994.

The Horsecatcher by Mari Sandoz. **Cheyenne**

When the **Navajo** Had Too Many Sheep by George Boyce, Indian Historian Press, 1974.

Navajo Life Series by Hildegard Thompson, Haskell Indian Nations University.

The Indian Way, Learning to Communicate with Mother Earth by Gary McLain, John Muir Pub., 1990. **Choctaw**

The Land, Remember the Land and Stock and People in Between Sacred Mountains: **Navajo** Stories and Lessons from the Land, Rock Point Community School (**Indian Author**), University of Arizona Press.

A Natural Education, Native American Ideas and Thoughts by Stan Padilla, Book Publishing Co., 1994.

Gifts of the Buffalo Nation, Intertribal Bison Cooperative, South Dakota.

The Secret of the White Buffalo, an **Oglala** Tale by C. J. Taylor (**Indian Author**)

Gift Horse by S. D. Nelson (**Indian Author**). **Lakota**

Where the Buffaloes Begin by Olaf Baker. **Blackfeet**

Dog People, Native Dog Stories by Joseph Bruchac (**Indian Author**).

Groundhog's Horse by Joyce Rockwood, Holt. **Cherokee**

ACTIVITIES FOR MAN, ANIMALS AND PLANTS UNIT -

1. Have students learn the relationships between man, animals and plants, read cultural materials and hear cultural perspectives relating to this topic, and observe relationships between man, animals and plants.
2. Have the students research what is being done to care for various animals and plants in the area/reservation. What offices are in charge of these things?
3. Is there any overgrazing of the land? Are the deer overpopulated? Is erosion taking place? Are there other situations that may threaten the plants and/or animals? How is science applied? How is math applied?
4. What kind of livelihood does the raising of livestock provide today? Compare it to the livelihood provided by the buffalo.
5. What does the class think about the cloning of animals?
6. Have the students write papers on what could be done to be better stewards of various animals or plants in the area/reservation, based on scientific knowledge. Have them choose different animals or plants. Have them present their papers to the class and to appropriate tribal offices.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University. Adapt these activities to meet your students' needs. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in the *Keepers* books.

MATH AND SCIENCE --

"RANGE ECOLOGY"

CULTURAL OUTCOMES:

II, IX

SCIENCE OUTCOMES:

I, II, III

MATH OUTCOMES:

II, VIII

CULTURAL OBJECTIVE:

Students will understand the Native American reverence for the relationship between plants and animals and their environment.

MATH OBJECTIVES:

Students will:

read a problem, think about it, choose an appropriate method of calculation, write the problem down, solve and analyze their answer

draw appropriate conclusions.

SCIENCE OBJECTIVES:

Students will:

understand the relationship between humans, plants, animals and the environment

know and use scientific recording and reporting skills

understand ecological relationships, including the human impact on nature and nature's impact on humans.



TEACHER'S BACKGROUND INFORMATION:

The Anishinabeg told the following story to illustrate man's dependence on the plant world:

Roses were once the most numerous and brilliantly colored of all the flowers. Such were their numbers and such were the variety and richness of their shades that they were common. No one paid much attention to them; their beauty went unnoticed, their glory unsung.

Even when their numbers declined and their colors faded, no one appeared to care. Cycles of scarcity and plenty had occurred. There was no cause for alarm. There is degeneration and regeneration. Plenty always follows scarcity.

But year after year roses became fewer in number. As the numbers and richness of the flowers diminished, the fatness of the rabbits increased. Only the bear, bee, and hummingbird were aware that something was wrong.

The tribe felt that something was not quite right, but they couldn't explain it. They only knew that the bear was thinner and its flesh less sweet. The bears found smaller quantities of honey and what they found was less delectable. The bears and the hummingbirds found fewer roses. The tribe was bewildered; the bears blamed the bees; the bees were alarmed. No one could do anything.

Eventually one summer, there were no roses at all. Bees hungered; hummingbirds grew thin; the bears raged. In later years, that summer was known as "The Summer of the Disappearance of the Rose." At last, everyone was alarmed. In desperation, a great meeting was called. Everyone was invited.

There were many days of discussion before the meeting decided to dispatch all the swift to search the world for a single rose and if they found one, to bring it back. Months went by before a hummingbird chanced to discover a solitary rose growing and clinging to a mountainside in a far off land.

The hummingbird lifted the faint and pallid rose from its bed and brought it back. On arrival, medicine men and women immediately tended the rose and in a few days restored the rose to life. When he was well enough, the rose was able to give an account of the destruction of the roses.

In a voice quavering with weakness, the rose said, "The rabbits ate all the roses."

The assembly raised an angry uproar. At the word, the bears, wolves and lynxes seized the rabbits by the ears and cuffed them around. During the assault the rabbits' ears were stretched and their mouths were split open. The outraged animals might have killed all the rabbits that day had not the rose interceded on their behalf saying, "Had you cared and watched us, we might have survived. But you were unconcerned. Our destruction was partly your fault. Leave the rabbits be."

Reluctantly, the angry animals released the rabbits. While the rabbits' wounds eventually healed, they did not lose their scars which remained as marks of their intemperance. Nor did the roses ever attain their former brilliance or abundance. Instead, the roses received thorns from Nanabozho to protect them from the avarice of the hungry and the intemperate.

Nanabozho, in endowing the roses with thorns, warned the assembly, "You can take the life of plants, but you cannot give them life."

...

The rose in this story can be compared to the endangered species of plants and animals which for so long were not noticed or cared for by the majority of the world's population. However, most of the Native Americans can be compared to the bear, the bee, and the hummingbird who did care, but were too small in number to achieve successful conservation by themselves. Only when it appeared that the rose had disappeared did the entire population become alarmed.

Let us consider other population groups and the ways in which they adjust their population to availability of food. The place where an organism lives is called a habitat. A group of one kind of organisms that live within the same area is called a population and the way the organisms are spaced or spread out in a given area is called the distribution. The home range is the area where a population of animals usually forages for food. There are 3 types of distribution:

- a. uniform-evenly spaced.
- b. random-irregularly scattered.
- c. clumped-bunched together in different areas.

Since plants can exist alone, they are called autotrophs and serve as the primary food producer in the food chain. Animals and humans are called heterotrophs since they can't exist without eating other living creatures, namely, plants, and are termed consumers. Thus, disruption or extinction of plant species has catastrophic effects upon the food chain and life cycles of all organisms. Careful treatment of Mother Earth and sensible methods of conservation are crucial for successful land and resource management.

After the Long Walk and the signing of a treaty, the Navajo returned to an economy based on sheep and other livestock. It is believed that by 1880 the Navajos' flocks surpassed the optimum livestock ratio for their land. A survey conducted in 1930 counted 1,111,589 mature sheep. In 1933 there were approximately 1.3 million sheep on the reservation. That is about 1 sheep for every 9 acres, while the carrying capacity of the range was 1 sheep for every 20 to 30 acres.

This type of imbalance occurred all across the western United States, causing the government to impose stock reduction on ranchers and also the Navajo people. The Dine' were unhappy about the stock reduction program because this was the base of their economy. Grazing regulations were approved for the reservation in 1956. However, severe damage had already been done to the range by overgrazing.

The following example shows what happens when grasses have been overgrazed. Note that snakeweed is poisonous to livestock.

1. The natural home of snakeweed is probably a rocky slope. Grasses grow better on the soils of the plain.
2. Animals can kill off grasses by biting them off again and again before they have a chance to grow. This leaves an open spot on the plain.
3. If livestock does not permit the grasses to grow, the snakeweed takes over the open area.
4. When snakeweed takes over, the animals go hungry.

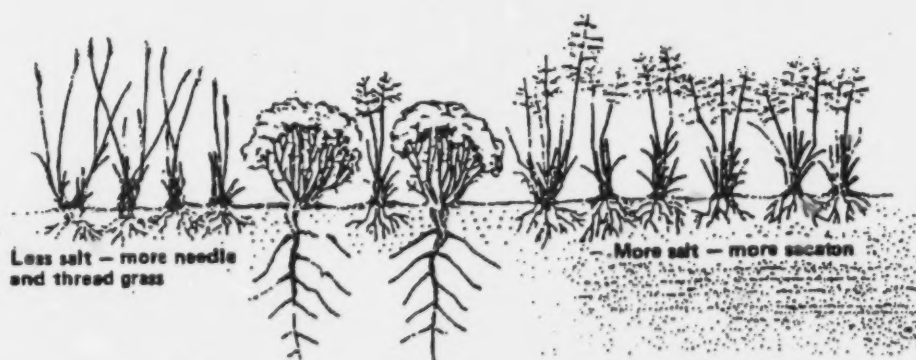
Plants' needs are specialized for their own environmental niche, although they all need soil, nutrients, water and light. Plants have varied sensitivities to amounts of nutrients, water and light that they need. Therefore, plants grow where their special adaptations make their survival possible. It is important to emphasize the importance of the interdependence of plants and animals, for they are all part of the Circle of Life.

Here are some examples of plants that are found on the reservation. These are some of the plants that the Department of Range Conservation plan to try to restore without a reduction in livestock:

1. Needle and thread grass—usually eaten before the seed has grown. Navajo—troh ts'ozi troh adishishi.
2. Alkali sacaton grass—a tall grass and the seeds can be used as food for humans. Navajo—troh dehakalii.
3. Indian rice grass—grows about 2 feet high and seeds may be eaten by people. Navajo—nidididii.
4. Galleto grass—very hardy in dry weather and the leaves are very tough. Navajo—troh tsahii.
5. Winter Fat—gray colored and is used for winter fodder for sheep. Navajo—gohtsohdii.
6. Sumac—a tall bush with red berries that can be eaten with sugar and cornmeal. Navajo—chitchin
7. Goosefoot—the largest species of this plant needs a lot of water and is named "lamb's quarter." Leaves and stems can be eaten when they are young. Navajo—troh deii tsoh.
8. Wild celery—small plant that should be picked before the flowers on the plant bloom. It is used in soups and stews.

Some individuals think that the Navajo can manage their grazing land with skillful herding. Some people believe it will be possible to have bigger and better herds by changing the old assigned permit areas and making the herds and flocks a group affair by pooling grazing permits.

The grazing committee for each chapter would be required to monitor and keep track of all the herds in their area. This idea is expressed in the video tape, "Distant Thunder."



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STUDENT LEARNING ACTIVITIES:

1. This first activity is a demonstration of how animals may compensate when there are excessive numbers of animals and a reduced food source.

Each student will need 10 poker chips of one color, 6 poker chips of a different color and four sandwich bags. The teacher will need a clothesline (100 ft.), a stopwatch or just a watch with a second hand. The teacher should have the data sheet made before beginning the activity. Using the clothesline, the teacher marks off a circle outside that has a diameter of 10 meters. The 10 poker chips of like color for each student are to be scattered in that circle. Mark off 2 more areas that are at least 10 meters away from the first circle and place 1/2 of the remaining poker chips in each circle.

2. Have the students play a game involving deer population. Have the deer represented by the sandwich bags and the poker chips represent food for the deer. For the deer to survive 1 year (1 minute), it must obtain at least 5 chips but can obtain no more than 10. Remember that deer do not share food.

Year 1: Have students predict how many deer will survive. All the deer should survive this year. Set the timer and have the students collect the food chips and place them in a plastic bag. Record the number of surviving deer on the data sheet.

Year 2: Redistribute the chips. Give each of the students who had surviving deer an additional plastic bag. Set the timer and have the students again gather food for their deer. Anyone who does not have at least 5 chips for each bag is out of the game. Record the number of survivors.

Year 3: Repeat year 2.

Year 4: Hand out 1 more bag for each surviving deer. Tell the students that because of the large number of deer in the population last year, the plants that deer eat were damaged and food production has been decreased. Remove 1/4 of the food chips and redistribute the remainder in the home range. Then gather food chips and record the number of surviving deer.

Year 5: Discuss with the group what the deer might do when the home range can no longer support them. Permit the group to search for new range, since the home range is depleted. At the end of the minute, call the group together and discuss how dispersal affected the number that survived.

Ask the following questions:

When was it easiest for the deer to survive and when was it the hardest?

What factors determined the carrying capacity of the home range?

If a person put out corn for the deer and then stopped suddenly, what would be the effect on the deer population?

3. Select the plants that are native to the home area and research information about the plants. The students will prepare illustrations which will include the scientific name, Indian name, uses of the plant, habitat and do an illustration of the plant. This should be done on display board or poster board.
4. Take a field trip to observe how plants and animals have adapted to a specific environment. They will then state a hypothesis, record data from their field trip and draw a conclusion which they need to verify with books on Botany and Zoology.
5. Draw a mural that shows how adaptations occur in nature. The students will describe the adaptations and state why these were necessary.
6. Interview individuals in their home areas. Students will explain that this is not a government survey but rather a class assignment. Inquire about the number of sheep, goats, cattle and horses they have. Students will graph this information using common area divisions.
7. Have a tribal ranger come to the school or have the class visit the ranger at the office. Ask the ranger to explain his jurisdiction and what his specific duties are.
8. Invite a Bureau of Land Management employee who has the responsibility of overseeing the reclamation of land to explain what the agency is doing to assist in reclaiming the land that has been overgrazed or otherwise destroyed.

RESOURCES:

Anderson, Don. Native American Science and Mathematics. Fond Du Lac, Minnesota: Department of Education, 1987. pp. 29-30.

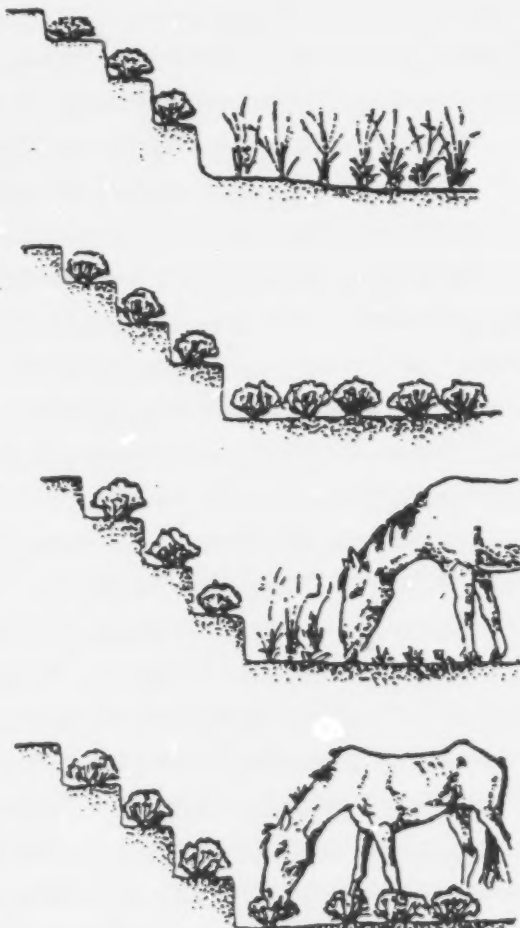
Reno, Philip. Navajo Resources and Economic Development. Albuquerque, New Mexico: University of New Mexico Press, 1981.

Jones, Thomas Jesse. The Navajo Indian Problem, An Inquiry. New York: 1939.

Evers, Larry. Between Sacred Mountains. Tucson, Arizona: Sun Track and the University of Arizona Press, 1984.

DEVELOPED BY:

Ivadene E. Dhority
Grover Parsons



NEEDLE AND THREAD GRASS



SCIENCE/MATH -

"Destruction of Habitat"

TEACHER BACKGROUND INFORMATION:

The extinction rate is higher now than when dinosaurs roamed the earth. The number and complexity of factors affecting the disappearance of species has continually increased. Human overpopulation, deforestation and pollution all contribute to the destruction of global wildlife habitats.

The destruction of global wildlife habitats threatens humans as well. The current threats to our environment can be controlled or even reversed, if everyone becomes educated and in turn educates someone else about the threat to our Mother Earth.

STUDENT LEARNING ACTIVITIES:

1. Discuss with students the effects of overpopulation, deforestation, and pollution. Record responses on the butcher paper.
2. Students will discuss how they can help stop the destruction of the wildlife habitat and record their responses.
3. Students will discuss the relationship of man, animal, and plants and how they interact to make new life. Record responses.

EVALUATION:

Students will illustrate, as groups or individually, how man, animals, and plants can help each other to stay alive and make more of its kind. They can use the responses from discussions. Share illustrations and thoughts.

In discussion, have the students responds to the following:

- "What have you learned about Endangered Species?
- "What do we mean when we say "Man, animals, and plants are one in the circle of life."

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RESOURCES:

1. Allman, William F. and Schrof, Joannie M.. "Can They Be Saved?", U.S. News & World Report, October 2, 1989: p. 52.
2. Bjerklie, David. "Endangered Species Act and its Discontents". Technology Review, May/June 1992: p. 19.
3. Caduto, Micheal J. & Bruchac, Joseph. Keepers of the Animals. Fulcrum Publishing, Golden, Co. 1991: pp. 223-243.
4. Cohn, Jeffery P.. "Decisions at the Zoo", Bio Science Vol. 42 No. 9, October 1992: pp. 654-659.
5. Corn, M. Lynne. "The Endangered Species Act; the storm's eye". Washington Watch, October 1990: p. 627.
6. Davis, Phillip A.. "Upstream Battle for Survival Draws Support Salmon". Environment, March 9, 1991: pp. 602-603.
7. Down, Ann Hudson, "The Gifts of the Tree", MASINAIGAN, Winter 1993: p. 22.
8. Kaplan, Kim J. "Bring 'Em Back Alive and Growing", Agriculture Research, July 1991: pp. 4-12.
9. McDowell, Jeanne & Seldeman, David. "The Landlord", TIME, March 8, 1993: p. 38.
10. Valerie, Taliman, "Logging Issue Hits Compromise State", Navajo Times Vol. XXXII, August 13, 1992: pp. 1-A8.
11. "Protecting Endangered Species Look Like a Losing Battle", MASINAIGAN, Winter 1993: p. 1.

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SCIENCE STANDARDS ADDRESSED IN UNIT-

Standard – Knows about the diversity and unit that characterize life

Benchmarks –

Knows that the major categories of living organisms are plants, which get their energy directly from sunlight; animals, which consume energy-rich foods; and microorganisms, some kinds of which cannot be neatly classified as either plants or animals

Knows that all organisms, including the human species, are part of and depend on two main global food webs: one global food web starts with microscopic ocean plants and seaweed, then to the animals that feed on them, and finally the animals that feed on those animals: the other global food web begins with land plants and includes the animals that feed on them, and so forth.

Standard – Understands the processes that shape the surface of the earth and the relation of the surface of the earth to the living environment

Benchmarks –

Knows that the composition and texture of the soil and its fertility and resistance to erosion are greatly influenced by plant roots and debris, bacteria, fungi, worms, rodents, and other animals, as they break up the soil and add organic material to it

Standard – Understands how species depend on one another and on the environment for survival

Benchmarks –

Knows that all species ultimately depend on each other; interactions between two types of organisms include producer/consumer, predator/prey, parasite/host, scavenger, decomposer, and relationships that are mutually beneficial

Knows that the kinds of organisms and the population densities in the ecosystem depend on conditions of the physical environment (e.g., sunshine, precipitation, minerals, range of normal temperature, topography) which were shaped by its geological and biological history

Knows that short-term changes in available food, moisture or temperature of an ecosystem may result in a change in the number of organisms in a population, or the average size of an organism; long-term changes may result in the elimination of a population

AMERICAN INDIAN STANDARDS ADDRESSED IN UNIT –

Life Science

Indian students should develop an understanding of concepts of nature's diversity, codependency and the intricate balance between natural forces and how they are reflected in traditional Indian philosophies.

Science in Personal and Social Perspectives

Indian students should develop an understanding of how environmental degradation may be occurring in their communities and/or on reservation lands

SUN, MOON AND STARS

As far back as 2,500 years ago, Indian people had a sophisticated understanding of the sky as evidenced by the finding of wheels made of stones that line up to mark the rise and setting of certain stars, the summer solstice or other observations of the sky. Tower-like structures built by ancestors of the Pueblo Indians in about 1100 have ports in the walls that admit the sun only on the winter and summer solstices indicating their sophisticated knowledge of the sun and the planets. In Illinois there is evidence of four large circles with post holes indicating their use for calendar purposes in the 11th century, much like Stonehenge. It served as a solar observatory and was probably used for measuring the timing and length of agricultural seasons, for ceremonial use, and for a calendar to keep track of delivery and shipments of products to outlying Indian settlements. The astronomical accuracy of the Indians of Mexico is astonishing. Many ceremonial sites are aligned with astronomical features. A Mayan-built cylindrical tower is deadly accurate for plotting the movements of the planet Venus. Many Indian stories are about the sun, moon and stars.

LITERATURE FOR SUN, MOON AND STARS UNIT-

Thirteen Moons on Turtle's Back by Joseph Bruchac (**Indian Author**), Paperstar, 1992.

Keeping Track of Time in Signs of Tradition: Native American Lessons, Masters Project, University of Kansas, 1994. **Mayan and Mandan**

Lakota Star Knowledge by Ronald Goodman, Sinte Gleska University, 1992.

Oot-Kwah-Tah, The Seven Star Dancers, **Onondaga**, How Grizzly Climbed the Mountain, **Shoshone**, and Creation of the Moon, **Navajo**, in Keepers of the Night by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum Pub., 1994.

How Fisher Went to the Skyland, **Anishinabe**, Spring Defeats Winter, **Seneca**, How Grandmother Spider Stole the Sun, **Creek**, and How Coyote Was the Moon, **Kalispel-Idaho**, in Keepers of the Earth by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1988.

Native American Stories by Joseph Bruchac (**Indian Author**). Includes the same stories as Keepers of the Earth.

How the Milky Way Got Into the Sky (**Warm Springs**), How the Morning and Evening Stars Came to Be (**Assiniboine**), How Daylight Came to Be (**Skokomish**), Educational Systems, Inc.

Skywoman: Legends of the **Iroquois** by Joanne Shenandoah and D. George, Clear Light, 1998.

Star Stories by Linda Skinner (**Indian Author**).

Stars in **Navajo** Tales.

Earth and Sky by R. A. Williamson

Earth Magic, Sky Magic by Rosalind Kerven.

Stars of the First People by Dorcas S. Miller, Pruett, Pub., 1997.

They Dance in the Sky, Native American Star Myths by Jean G. Monroe and Ray A. Williamson, Houghton Mifflin, 1987.

Star Tales, North American Indian Stories and More Star Tales, North American Indian Stories by Gretchen Mayo, Walker & Co.

American Indian Star Tales by L. Moroney, Feathermoon. Also on audio tape.

The Earth Under Sky Bear's Feet by Joseph Bruchac (**Indian Author**), Putnam & Grosset, 1995. Twelve poems about the Big Dipper. **Mohawk, Anishinabe, Pima, Missisquoi, Winnebago, Cochiti Pueblo, Lenape, Chumash, Lakota, Navajo, Pawnee**

The Rings on Woot Kew's Tail, Council for Indian Education.

ACTIVITIES FOR SUN, MOON AND STARS UNIT -

1. Have the students learn about the sun, moon, stars and sky, read cultural materials and hear cultural perspectives relating to the topic and observe the night sky. Have them learn about the remarkable knowledge Indians had.
2. Have the students research the local tribes' stories, beliefs and observations about the sun, moon, stars and sky.
3. How are these different from what is usually taught in school around these topics? What would our Indian ancestors think about new findings in space and space exploration today? What is the cost and worth of these?
4. Have the students prepare a display, to be placed in a prominent place in the school, providing information based upon their research and speculation.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University. Adapt these activities to meet your students' needs. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in the *Keepers* books.

MATH AND SCIENCE --

"STAR LIGHT, STAR BRIGHT"

CULTURAL OUTCOME:	IX
MATH OUTCOMES:	II, IV
SCIENCE OUTCOME:	IV

CULTURAL OBJECTIVE:

Students will associate an American Indian constellation legend with the study of stars.

MATH OBJECTIVES:

Students will:

interpret problems, choose an appropriate method of calculation, translate to numerical expressions, and solve

explore linear relationships graphically using graph paper and computer or calculator graphics

using symmetry in two and three dimensions, describe geometry in the world of art, nature and construction

identify geometric figures (pentagon, octagon, rhombus, etc.).

SCIENCE OBJECTIVE:

Students will know and apply the fundamental concepts of astronomy.

TEACHER'S BACKGROUND INFORMATION:

The fisher is a fox-sized animal that is closely related to weasels. It has fox-like movements. Its fur can be greyish brown or reddish above to black and dark brown below. The belly may be dappled with white. The legs, belly and tail usually are black. The fisher does not like water. It hunts squirrels and other small animals. (Show a picture of a fisher).

Tell the story "How Fisher Went to the Skyland: The Origin of the Big Dipper".

In the legend young Fisher, the great hunter's son went hunting one day. He caught a squirrel and was about to kill him when the squirrel gave young Fisher some good advice. Since the weather was always cold upon the earth during those days, the squirrel told young Fisher to ask his father to use his powers to bring warm weather to the earth. Fisher went to the place where the skyland is closest to the earth. Fisher took his strongest friends with him—Otter, Lynx, and Wolverine. When they reached the top of the highest mountain, they smoked their pipe and sent prayers and smoke to the Four Directions asking for success. Otter tried to jump first to break through into the skyland above. He fell and slid on his belly to the bottom of the mountain, just as they do today. Lynx jumped up and struck hard but fell back unconscious. Fisher tried but had no luck. Wolverine, the strongest of all, leaped up and struck hard against the sky. He fell back, but he kept trying until he made a crack in the sky. Once more he jumped, broke through and jumped into the skyland.

It was beautiful and warm. They found birds in cages. They freed them so that they could fly through the hole in the sky. Next, they worked at making the hole in the sky bigger bringing warmth to the earth. The sky people came out to stop them. Wolverine jumped back through the hole to escape, but Fisher kept working at making the hole bigger.

When he had made the hole big enough for earth to have warm weather for half of the year, the sky people were too close, so he stopped. To distract them from repairing the hole Fisher taunted them. He ran from them as they shot arrows at him. There was only one place on his tail where an arrow could kill him. An arrow struck the fatal spot. He began to fall, but he never hit the earth. Gitchee Manchee took pity on him because he had worked so hard to do something good for all the people. Gitchee Manchee placed Fisher high up in the sky with the stars. Today we can still see him each night. He is called The Big Dipper. When the arrows hit him, he turns over onto his back in the winter sky. When winter is almost over, he turns upright and brings warm weather back to the earth. (Adapted from Keepers of the Earth).

The Great Bear, Ursa Major, is the best known of all the constellations (groups of stars in a fixed pattern). The Big Dipper is only a portion of the constellation of the Great Bear. The seven stars of the Little Dipper outline the entire constellation called the Little Bear, Ursa Minor. Stars are often very distant from one another, even though they appear to create star patterns in the sky. There are 88 constellations and 41 of them can be seen from the northern hemisphere. The constellations—the Big Dipper, Little Dipper, Cassiopeia, Cepheus, and Draco are circumpolar (located close to the North Star and are visible all year long). Other constellations can only be seen during different seasons.

Major constellations and when they can be observed are listed below:

<u>SPRING</u>	<u>SUMMER</u>	<u>FALL</u>	<u>WINTER</u>
Leo	(northern skies)		Taurus
Bootes	Aquila	Pegasus	Canis Major
Virgo	Cygnus	Andromeda	Canis Minor
Corvus	Lyra	Perseus	Gemini
Crater		Triangulum	Orion
Cancer	(southern skies)		Auriga
	Sagittarius	Pisces	
	Libra	Aries	
	Scorpius	Aquarius	
		Capricornus	
	(near the zenith)		
	Hercules		
	Corona Borealis		
	Sagitta		
	Delphinus		
	Ophiucus		

The Milky Way, our galaxy, is seen as a pale band of stars in the night sky. There are more than 100 billion stars, planets and other heavenly bodies located in the Milky Way. Our solar system consists of our sun, nine major planets, the planets' moons, and all other satellites of the sun such as comets and asteroids. Stars with greater magnitude are brighter than others. A star with a magnitude of 1 is 2.5 times brighter than a star with a magnitude of 2. The moon (magnitude -12.5) is given a negative number since it is extremely bright.

The Sun is a star 850,000 miles (1,367,956 km) in diameter and 93,000,000 miles (149,670,480 km) away from the Earth. The Sun is a fiery ball due to the never-ending nuclear reaction in which heat and light are released as hydrogen and changed to helium. The light of the Sun travels through space for 8 minutes and 20 seconds on its trip to the Earth. Our sun is 107 times larger in diameter than the Earth with a surface temperature of 10,000 degrees F or 5,538 degrees C. It is a middle-aged star. Alpha Centauri, the next closest star, is four light-years away. (A light-year is the distance light travels in a year).

Planets (Greek for "a wanderer") move in relation to the stars and each other. Planets shine more steadily and twinkle less than stars. Looking through a telescope, a planet looks like a disc and stars are just points. Outside on a starry night, the zenith (the highest point in the sky or the point directly overhead) is a good point of reference. The stars of the Big Dipper are another good point of reference.

The meridian is the imaginary line that runs from the northernmost point on the horizon through the zenith and down to the southernmost point on the horizon. The ecliptic is the path of the Sun through the constellations during the year including the zodiac (a band of twelve constellations).

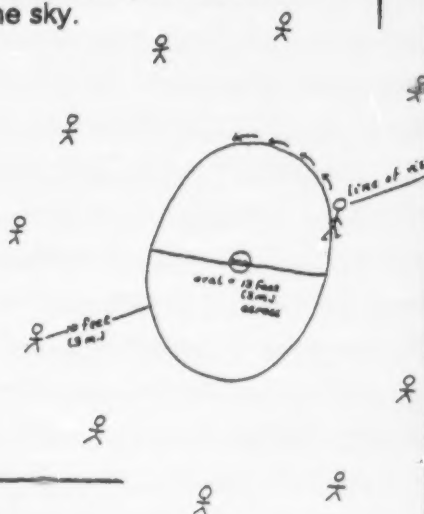
(The teacher can use a flashlight as a pointer, but children don't need them.) Meteors (solid particles or objects from outer space) that are pulled downward by the Earth's gravity may be seen. They are commonly called "shooting stars" or "falling stars". They leave a brief glowing streak before they burn up in our atmosphere. A faint planet-like light moving steadily across the sky for no more than 6 minutes is a satellite (visible because it reflects sunlight). Several examples of possible transparencies or worksheets are attached for your use.

STUDENT LEARNING ACTIVITIES:

1. Read the legend *How Fisher Went to the Skyland: The Origin of the Big Dipper*, taken from Keepers of the Earth, pp. 116-120. Discuss it and ask the following questions:
 - a. Why does Fisher feel he needs to bring warm weather to the Earth?
 - b. Why did Fisher choose his friends, Otter, Lynx and Wolverine, to go with him?
 - c. Explain the reason for offering smoke to the Four Directions on the top of the mountain.
 - d. How did the Earth get its first supply of birds?
 - e. Why did Fisher continue to chew when Wolverine stopped and jumped back through the hole to escape?
 - f. Why did Gitchee Manitou take pity on Fisher? How was Fisher rewarded for his sacrifice?
2. Use the background material and pictures to discuss the solar system, the Milky Way Galaxy, circumpolar constellations, and major reference points used for locating heavenly bodies in the sky.

ACTIVITY 3

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3. Make a model of the relationship between the Sun, Earth and constellations to demonstrate the zodiac. See Activity 3 diagram. Outside, use chalk, string or a stick and a measuring tape to draw a large oval or ellipse on the ground about 10 feet (3 meters) in diameter and stand someone in the center to represent the Sun. The ellipse is the Earth's path as it revolves around the Sun. Space 12 children around the ellipse about 10 feet out from the edge. The 12 children are stars and constellations. Another child is the Earth. He/she walks counterclockwise around the inner ellipse while looking over his/her right shoulder at the constellations around the Sun. Students will see why certain constellations are visible during each season. This band of constellations is the zodiac. The band can be broken up into 12 parts called the Signs of the Zodiac.

4. Collect pictures of the constellations. Find the constellations in the sky on a starry night. Listen to myths and legends about the constellations. Look for meteors and find out what they are. Use binoculars for viewing. Refer to reference books for pictures of constellations, books containing myths about the constellations, and pictures of star maps.

5. Have students walk between scale models of the Sun and Earth placed at the correctly scaled distance from one another—1 in. = 64,000 miles or 1 cm = 40,567 km. Do this activity outside. (Background: the Earth is 7,913 miles or 12,735 km in diameter, the Sun is 850,000 miles or 1,367,956 km in diameter, and the distance between them is 93,000,000 miles or 149,670,480 km).

The Earth will be the 1/8 in. (1/3 cm) sphere—a kernel of popcorn, the Sun 13 1/4 in. (33 2/3 cm) sphere—a basketball, and the distance between them will be 121 ft. or (37 m).

Measure the distance. One child holds up the Earth at one end of the line and Sun is held up at the other. Tell the children they will be walking twice 93 million miles (149,670,480 km). They stroll from the Earth to the Sun and back again.

6. The class will calculate a light-year and the time it takes sunlight to reach Earth. Use a timer to demonstrate elapsed time between light leaving the sun and arrival on Earth.

Light travels at a speed of 186,000 miles (299,341 km) per second. Calculate the distance traveled by light per second (x 60), per hour (x 60), per day (x 24), and per year (x 365). This last distance is called a light-year (approx. 6 trillion miles or 9.5 trillion km).

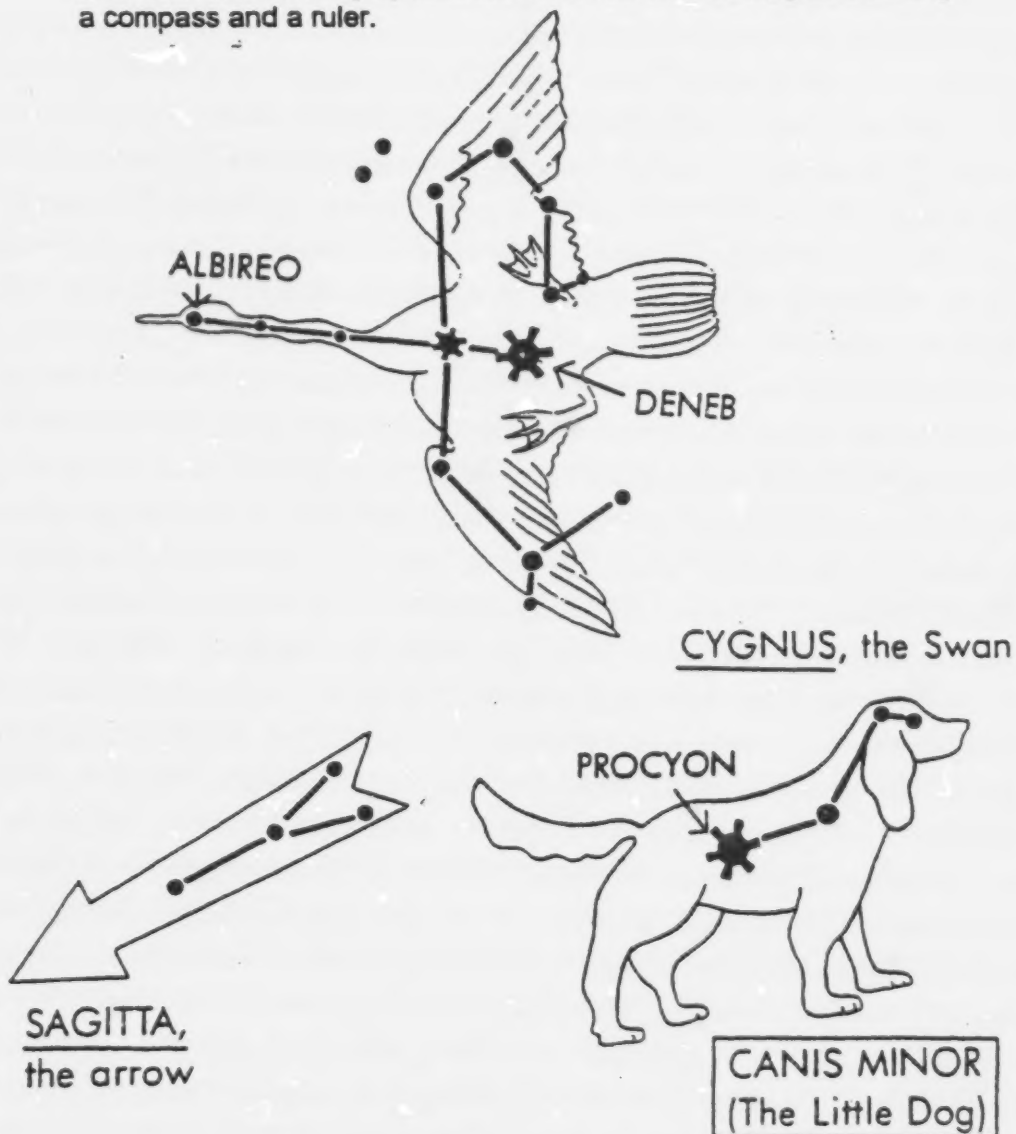
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The distance between the Earth and the Sun is 93,000,000 miles (149,670,480 km). Calculate the time it takes for sunlight to reach Earth.

$$\frac{93,000,000 \text{ miles (149,670,480 km)}}{11,160,000 \text{ miles (17,960,457 km) /min}} = 8.33 \text{ min or } 8 \text{ min } 20 \text{ sec}$$

Set the timer at 8 min. and 20 sec. Tell the children you are timing the sunlight on it's journey to Earth-"On your mark! Get set! Sunshine!" Continue activities until the bell sounds.

7. Share the two American Indian poems about stars. See "The Geometry of a Star" directions attached. (Explain that Pleiades is a young group of stars in the constellation Taurus—six of which can be seen with the naked eye.) Give oral directions for drawing a star using a compass and a ruler.



EVALUATION:

Keep a learning log for each activity. Teacher grades on:

1. Answers to questions.
2. Notes on Milky Way galaxy, circumpolar constellations, and major reference points.
3. Notes on demonstrations.
4. Notes on myth, legends, and stargazing.
5. Notes on activity.
6. Answer to time it takes for sunlight to reach the Earth.
7. Correct geometric star construction.

RESOURCES:

Anderson, Dan, Native American Science and Mathematics. Fond Du Lac, Minnesota: American Indian Language and Culture Education Program, 1987.

Bruchac, Joseph and Caduto, Michael J. Keepers of the Earth. Golden, Colorado: Fulcrum, 1989.

Skinner, Linda. Cultural Curriculum for Communities. Oklahoma City, Oklahoma: Oklahoma State Department of Education, 1989.

The Planetarium. Kansas City, Missouri: Southwest Science and Math Magnet School, 1991.

DEVELOPED BY:

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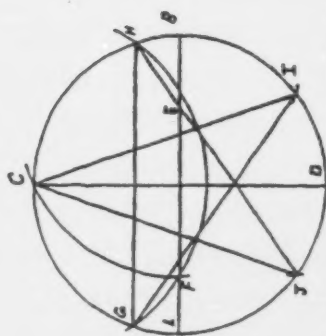




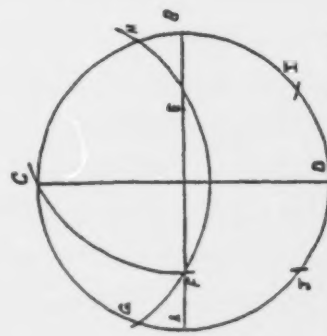
A PERFECT FIVE-POINTED STAR

Stars are not hard to draw, if you have a pencil, a compass, a ruler and some instructions. Here are the instructions. So find some tools and make some stars.

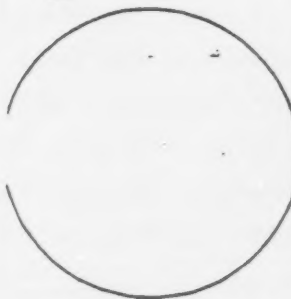
We are the stars that sing
We sing with our light.
We are the lords of the
We fly across the heavens.
Our light is a sign.
—Percy Bysshe Shelley



SEVENTH, draw straight lines connecting points C and J, E and I, and J, I and C. Erase all unnecessary lines and you will have the perfect star.

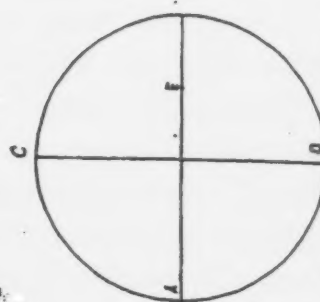


SIXTH, keeping the compass set in the same way and with H as center, mark point F on the circumference. Then, with F as center, mark off point J.

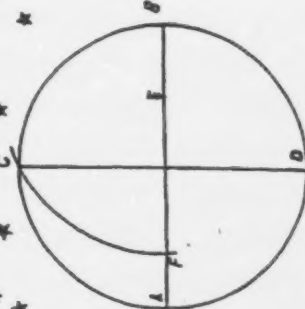


FIRST, draw a circle the size of the star you want to draw. The points of the star will touch the circumference.

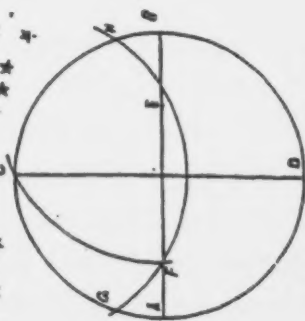
SECOND, make two diameters AB and CD at right angles to each other. This must be square.



THIRD, divide in half the line from the center to B. The half way point is E.



FOURTH, set the compass so the point is at E and the pencil is at C. Draw an arc from C to F. F is the place where the arc meets the diameter AB.

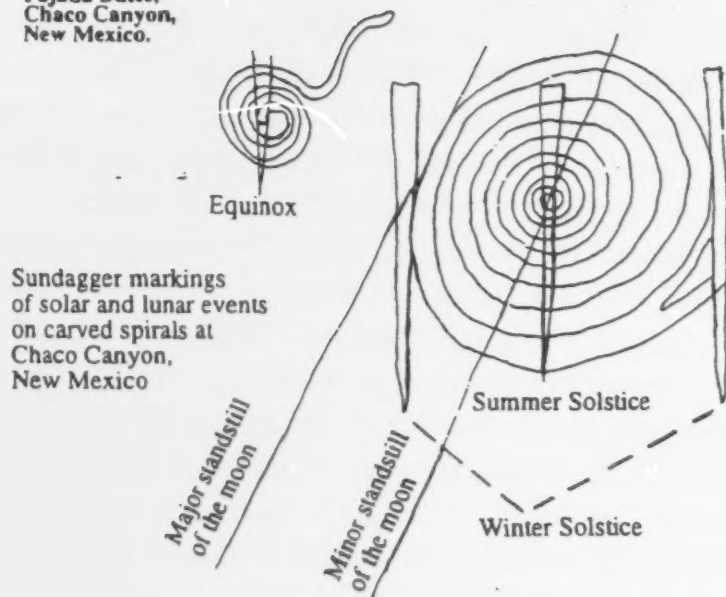


FIFTH, put the point of the compass at C and pencil at F. With C as center, draw an arc from F to H as shown.

THE GEOMETRY OF A STAR

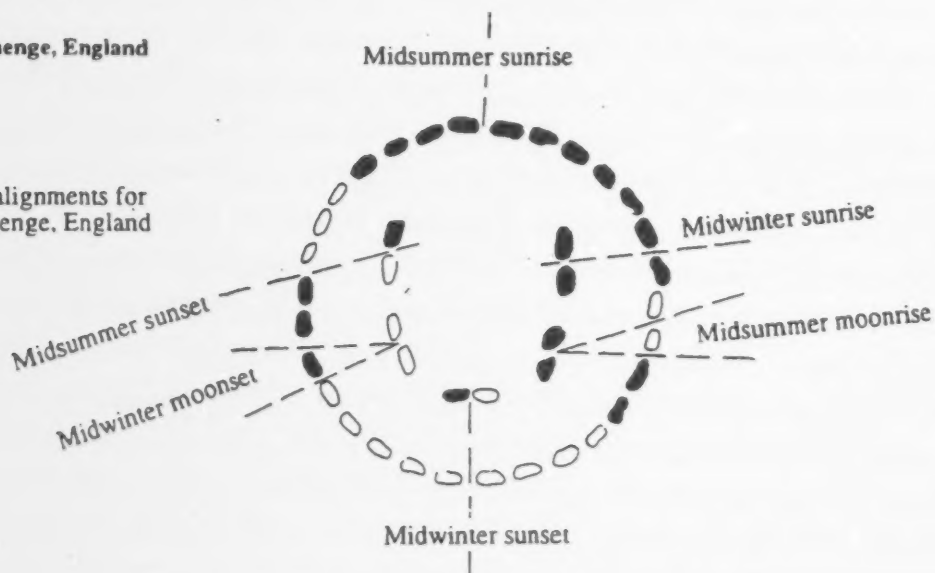
Ancient people kept track of time through solar and lunar events

Fajada Butte,
Chaco Canyon,
New Mexico.



Stonehenge, England

Stone alignments for
Stonehenge, England



BEST COPY AVAILABLE

SCIENCE STANDARDS ADDRESSED IN SUN, MOON AND STARS UNIT –

Standard – Understands the convictions scientists share

Benchmarks –

Understands that scientific knowledge is subject to modification

Standard – Understands essentials about composition and structure of the universe

Benchmarks –

Knows that light travels from the sun to earth in a few minutes, from the next nearest star in four years, and from very distant stars, several billion years; the distance light travels in a few years would take the fastest rocket thousands of years to travel

Understands that stars differ from each other in size, temperature and age, but appear to be made up of the same elements and to behave according to the same principles; but, unlike our sun, most stars are in systems of two or more stars orbiting around a point

Knows that nine planets of very different size, composition, and surface features orbit around the sun, and some planets have a variety of moons and rings of particles orbiting around them: the earth is orbited by one moon, many artificial satellites, and debris

Knows that many pieces of rock and ice orbit our sun: some meet the earth in its orbit, glow and disintegrate from friction as they plunge through our atmosphere; other objects have long, off-center orbits that bring them close to the sun, whose radiation boils off material and pushes it into a long, illuminated tail

Standard – Knows basic concepts about the earth

Benchmarks –

Knows that we live on a fairly small planet, the third from the sun in the only system of planets definitely known to exist (although other, similar systems might be discovered)

Knows that the earth is mostly rock and much larger outer planets are mostly gas

Knows that because of the tilt of the earth's axis, sunlight (and hence heat) falls more intensely on one part or another of the earth during its one-year revolution around the sun: the change in the amount of heat produces the seasons

Knows that the combination of the earth's yearly orbit around the sun and the moon's orbit around the earth once in about 28 days changes the way sunlight falls onto the moon, resulting in the phases of the moon

Standard – Knows the kinds of forces that exist between objects and within atoms

Benchmarks –

Knows that the sun's gravitational pull keeps the earth and other planets in their orbits, just as the planets' gravitational pull keeps their moons in orbit around them.

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED –

Earth and Space Science

Indian students should develop an understanding of the regular and predictable motion of the sun and moon and the places and ways in which American Indians observed them and how they employed their observations, e.g. in agriculture

ABUSE OF ALCOHOL AND DRUGS

Alcoholism/drug addiction is one of the most serious health problems facing the Indian people today. This fact is now clearly recognized both by Indian leaders and by the Indian Health Service. A task force of the Indian Health Service suggested this definition for alcoholism: "A disease, or disorder of behavior, characterized by the repeated drinking of alcoholic beverages which interferes with the drinker's health, interpersonal relations and/or economic functioning." Some view addiction as a disease and cite findings that show a biological basis for it. Others see it as rampant among Indian people as the result of intergenerational trauma. Whatever the cause, the majority of suicides, murders, accidental deaths and injuries among Indians are associated with it, as are many cases of infection, cirrhosis and malnutrition. By far the majority of arrests, fines and imprisonments of Indians are the result of addiction. The associated loss of productivity and the resulting abnormal social adjustments are by-products of considerable importance. Addiction among Indian people is a problem that deserves the best efforts of everyone working together to address the urgency of the situation. Many Indian people who have become addicted have been helped to stop using through treatment programs and/or Indian spirituality.

LITERATURE FOR ABUSE OF ALCOHOL AND DRUGS UNIT -

The Heart of a Chief by Joseph Bruchac (Indian Author).

Green March Moons by Mary Tall Mountain (Indian Author), New Seed Press, 1987.

The Window by Michael Dorris (Indian Author).

ACTIVITIES FOR UNIT -

1. Have the students learn about the use of alcohol and drugs, read cultural materials and hear cultural perspectives relating to this topic, and visit and learn about local programs and efforts to address abuse and addiction.
2. Have the students do research to find statistics relating to alcohol and drug abuse nationally. Chart the findings.
3. Have students do research to find information relating to studies and findings regarding treatment of addiction.

4. Have students write personal narratives about how this topic affects them. Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University. Adapt these activities to meet your students' needs. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities for this unit. They will suggest further science and math activities.

SCIENCE --

"ALCOHOL OR LIFE: IT'S YOUR CHOICE"

CULTURAL OUTCOME: IX
SCIENCE OUTCOME: III

CULTURAL OBJECTIVE:

Students will realize that Native American people teach a respect for our bodies and minds, and that our bodies should not be abused or damaged by the misuse of drugs or alcohol.

SCIENCE OBJECTIVES:

Students will:

conclude that some drugs are helpful and others are harmful to the body

classify drugs as stimulants, depressants, hallucinogens, and inhalants, and know the effects of these drugs

Students will explain the effects of drugs upon the body.

TEACHER'S BACKGROUND INFORMATION:

The use of drugs leads to a life out of balance or a life out of harmony with the native way of thinking about a person's relationship to Mother Earth. To help the students realize the dangers of substance abuse and bad associates, discuss the "Pow Wow" story with them and have them read the play, "The Choice," in class.

"POW WOW"

One time I was with my friends having a good time at the Pow Wow, dancing and visiting with old friends. A group of kids decided to sniff glue in the restroom and invited me to tag along. The Security Guard caught us and called the police. They took us to the Police Station and made us wait until they located our parents.

On the road back home from the Police Station, my father looked so sad and tired that I felt sorry that he and my mother had to leave the Pow Wow because of me. My father said, "When you are with your friends and they do something bad, you are going to be blamed even though you had no intention of trying drugs. You are like a bunch of sheep! If one runs across a field and falls off a cliff, the others follow and do the same thing. All are lost forever. So, if you don't want to get into trouble with alcohol or drugs, don't associate with people who abuse them."

"THE CHOICE"

(A One-Act Play)

Characters

- Peter Sam: A track star and boxer, a quiet champion, somewhat serious
- Howard: A brain, a smart person who can figure out anything
- Harlan: An all-around athlete and good student; a good person but will try almost anything
- Erma: A smart girl who grew up too fast — a lot of boyfriends, likes to party
- Kathy: Intelligent, mature, a down-to-earth thinker, very polite
- Monica: A track star, olympic material sprinter, able to be a good student when she wants to be. Likes to party, very hard family life

The Setting:

The scene takes place at an old school which is really the center of the community. There is a big field by the school. This is where the students meet after school to talk and chum around. It is a warm evening, near the end of the school year. Erma, Kathy, Peter Sam, and Harlan are sitting on an old bench, talking about the school year and thoughts of the coming summer. Howard and Monica will enter later.

Scene One:

- HARLAN: "Hey, Peter Sam, how was practice today? Are you ready for Nationals?"
- PETER SAM: "I dunno, those guys are always fast."
- HARLAN: "I coulda made it too, but I just didn't wanna run that day. Where are Nationals, anyway?"
- PETER SAM: "I think those Nationals are down in California, innit?"
- ERMA: "Oh, Harlan, you always say that coulda."
- HARLAN: "I coulda —"
- KATHY: "Maybe you shoulda tried Harlan —"
- ERMA: "Kathy, when are you leaving for that Science Fair, huh?"
- KATHY: "Saturday, it's in San Francisco for three days."

Enter Howard and Monica. The first four say "Hi" to Howard and Monica.

- HOWARD: "Hey, Kathy, are you going to that big Science Fair?"
- KATHY: "Ya, I'm going. We leave Saturday for three days."
- HOWARD: "I could have went too. Mr. Newton said my project was good enough but those houndgy judges said I didn't get it in on time."

MONICA: "Well, Howard, Mr. Newton told us to have our projects there and set up by 6:00 and no one could even find you."

HOWARD: "My mom said she would pick me up at 5:00 but I wasn't home. Mr. Newton said I should rewrite part of my project, but I stayed home from school 'cause I didn't want to. Mr. Newton is always making us rewrite everything."

KATHY: "You have a good project, Howard. You could have proved that windmills will work here, and you could have rewritten it easy enough."

HOWARD: "I know." (laughing) "Mr. Newton really got mad at me too when I told him I didn't want to get up that early to get on the airplane."

HOWARD TO MONICA:

"Well you could have been in those track Nationals too if you would have gone to that one meet."

MONICA: "I beat all those kids once in that first meet, so why should I have to run again in the Regionals?"

ERMA: "They should just take your best time in any race for Nationals. It's not fair to make you race in a Regional."

MONICA: "Aw, let's forget about it anyway. Peter will win. Come on you guys; let's party."

KATHY: "It's Thursday night."

HOWARD: "It's the end of the year. You don't really have to go to school tomorrow."

MONICA: "I can get some booze. Who can get money?"

STUDENT LEARNING ACTIVITIES:

1. Have a class discussion on "Is Alcoholism Inherited?"
2. Define and discuss the vocabulary words below:

alcohol	alcohol abuse	alcohol user
depressant	symptoms	withdrawal
cold turkey	genes	alcoholism
diabetes	cells	inherited disease
3. Divide the class into groups of five. Have each of the groups write a five-minute skit, using the vocabulary words in appropriate context.
4. Have each group perform its skit for the class. Videotape the skits.
5. Discuss each of the skits and list the concepts which the class learned from the skits. Then discuss each value and concept. Discuss inherited diseases.
6. Discuss the ways in which our bodies and behavior are affected by alcohol.
7. Read the booklet, "What Everyone Should Know About Alcohol and Health." Read the captions on each page and discuss them.
8. Have the students create crossword puzzles and mazes, including the alcohol terms that they have learned.
9. Spinning Game
 - a. Discuss how spinning around several times is similar to being under the influence of alcohol.
 - b. Divide the students into groups of three or four. Let each individual student in the group experience the feeling of wooziness. Have the group spin each student around until they are fairly dizzy. Then have them perform the following tasks, discuss, and record the results:
 - walking heel to toe;
 - standing on 1 leg for 30 seconds;
 - bringing fingers to nose, using alternate ;
 - hands, with eyes shut;
 - pointing to a specific object on the wall.

c. Explain that people who drive after drinking feel more confident; yet, their judgment and abilities are drastically affected.

10. Discuss alcohol as a disease. Make sure that the students understand how it affects the individual. As a class, create a bulletin board that distinguishes between the apparent "Glamour" and the "Reality" of drinking behaviors. The class can use advertisements, articles, or whatever is relevant on the topics. It could be titled, "Is Alcohol Really Glamorous?"

Afterwards, discuss what was put on the bulletin board, why they used that particular item, and what they learned from the activity and newspaper and magazine articles.

11. Read "The Choice" as a class activity. This play should provoke class discussion about making difficult choices in today's world. Discuss what choices the students have made today (e.g. clothing, breakfast, how to do their hair, etc.). Then discuss what they did over the past weekend.

Hand out copies of the play. Let the students have a few minutes to read it. Ask for volunteers for each character and narrator. You may have two groups with each performing the same play in order to give everyone a chance.

Have some students work on their parts while others prepare the props, etc.

Perform the play, afterwards, have the students talk about their character roles. Videotape the play if possible.

Adapted from Science Activities for Teachers: A Collection of Lesson Plans.

EVALUATION:

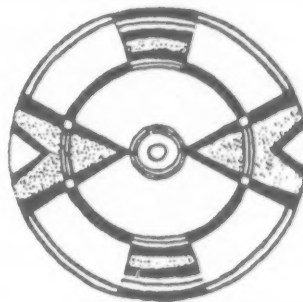
1. Have a class discussion over the following questions:
 - a. How would you say "No" to your friends?
 - b. What would happen if you were accused of something you did not do because of your association with the wrong people?
 - c. What would you do if you were invited to the wrong kind of party?
 - d. Would you take a drink or smoke a joint just to be accepted as one of the group?
 - e. Would you take a stand against drugs and call your parents to come take you home?
 - f. Would you stay at an unsafe party and say nothing even though you were worried about being there?

RESOURCES:

American Indian Science and Engineering Society, National Science Foundation. Science Activities for Teachers - A Collection of Lesson Plans. National Science Foundation Grant, June, 1987.

DEVELOPED BY:

Diane Cleveland
Elaine Hendricks
Renata Griego



SCIENCE STANDARDS ADDRESSED IN ABUSE OF ALCOHOL AND DRUGS UNIT-

Standard – Understands the convictions scientists share

Benchmarks –

Understands that scientific knowledge is subject to modification

Standard – Understands that scientific inquiry works in particular ways

Benchmarks –

Understands that expectations and strong beliefs can affect objectivity and that scientists regularly take steps to safeguard objectivity through the design of their investigations, the examination of data, and the use of independent review

Standard – Understands the main individual, social, ethical and institutional aspects of science

Benchmarks –

Understands that the ethics of science require that potential subjects be fully informed of the risks and benefits associated with the research and their right to refuse to participate

Standard – Understands the conditions necessary for maintaining good physical health and why they are necessary

Benchmarks –

Knows that toxic substances (e.g. tobacco, alcohol and other drugs) are bad for people's health and avoiding toxic substances increases one's chances of living longer

Standard – Understands some aspects of good mental health and the conditions that promote it

Benchmarks –

Knows that both outside conditions and internal conditions (chemical, history, values) influence how people feel and behave; sometimes people don't know why they feel the way they do, and some forms of treatment help them uncover the reasons
Knows that individuals differ greatly in their ability to cope with stressful situations; often people react to mental distress by denying that they have any problem
Knows that social contacts and support may help an individual to cope with the effects of mental stresses and to resist certain dangerous activities

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED –

Life Science

Indian students should develop an understanding of concepts of nature's diversity, codependency and the balance between forces and how they are reflected in traditional Indian philosophies and symbols, such as the Medicine Wheel.

Science in Personal and Social Perspectives

Indian students should develop an understanding of American Indian contributions to the science of psychology

WATER

Water is central to all life processes. It has been an important element in Indian cultures and is a sacred substance. There is a spiritual connection to the clouds and to the rains. Water is one of the four elements, with fire, air and earth, sometimes referred to as the Four Ancestors by Indian people. These elements are gifts and must be treated with respect. We cannot keep polluting our water sources. About 20 countries are currently water-scarce or water-short. The number is to double by 2020 (United Nations). The need to care for Mother Earth and her gifts has to be taught to all ages.

LITERATURE FOR WATER UNIT -

How Thunder and Earthquake Made Ocean, **Yurok**, The Hero Twins and the Swallower of Clouds, **Zuni**, Koluscap and the Water Monster, **Micmac**, How Raven Made the Tides, **Tsimshian**, and Sedna, the Woman Under the Sea, **Inuit**, in *Keepers of the Earth* by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1988.

Seya's Song, a **Northwest** Story using S'klallam Words by Ron Hirschi.

Coyote Takes Water from the Frog People by Barry Lopez in *American Indian Myths and Legends* by Richard Erdoes and Alfonso Ortiz (**Indian Author**), Pantheon, 1984.

Blue Dawn, **Pueblo**, in *Keepers of Life* by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1998.

Four Ancestors: Stories, Songs and Poems from Native North America by Joseph Bruchac (**Indian Author**), Bridgewater, 1996. Selections about water.

ACTIVITIES FOR UNIT -

1. Have the students learn about water and water conservation, read cultural materials and hear cultural perspectives relating to this topic, and determine the local water situation.
2. Have the students research to learn what the water source(s) are for the area/reservation. What do they think the quality of the water is?
3. How precious is water? What does it cost? How is it purified? How much does an average family spend for water in a month? Other math applications?

4. Have the students write an article on water conservation for the newspaper. Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University. Adapt these activities for your students. Review the science standards for this unit to suggest further science and math activities. Utilize the activities in the *Keepers* books.

SCIENCE – GRADES

“WATER BLAST, TOO”

CULTURAL OUTCOMES:

II, IX

SCIENCE OUTCOMES:

I, II, III

CULTURAL OBJECTIVE:

Students will understand that water is Giver of Life and that man must help to conserve the water that we have.

SCIENCE OBJECTIVES:

Students will:

know and use scientific reporting skills

conduct a scientific experiment

understand the relationship between humans, plants, animals, and their environment

understand ecological relationships, including the human impact on nature and nature's impact on humans.



TEACHER'S BACKGROUND INFORMATION:

Read the myth "Koluscap and the Water Monster" from Keepers of the Earth which tells the story of a great drought upon Mother Earth. This drought caused a great hardship on the people. The streams even stopped flowing so that there was no water to be found. The leader of the people sent someone to investigate why there wasn't even water in the streams. This individual discovered that a dam had been built across the stream. He returned to the village to tell the people who decided to send a messenger to the chief of the tribe that had built the dam. The messenger returned to the people with a bark cup full of water, and he stated that the chief would not give him any more. The people tried to fight the tribe that controlled the water but a monster rose from the dam and killed all but one of the beleaguered tribe's warriors. The tribe then prayed and Koluscap appeared and asked for water. He went to the dam and asked for water, which was denied him. He repeated the action four times.

On the fourth time, he was given a cup of filthy water which greatly angered him. He stomped this foot and the dam began to crack. Each time he stomped he grew taller; he grew bigger than the monster. Koluscap grabbed the monster and turned him into a bull frog. The water returned to the village and the people were so happy that some of them jumped into the water and became fish.

This myth is a good introduction to a discussion about why people get so upset when reservoirs are built on their reservations.

To the native people of the Southwest, few things are more important than water. The Dine' speak of two types of rain: male rain that is violent and strikes the earth hard; and female rain which falls gently, thus soaking the soil.



The teacher should also read the myth "Hero Twins and the Swallower of the Clouds" from Keepers of the Earth (pp. 79-81). The following is a brief synopsis of that myth:

Once there was giant living above Canyon De Chelly who destroyed humans and squeezed water from the clouds. Because this giant was swallowing all the clouds, the springs dried up, the crops dried up and the people were suffering. Some of the people had died. The Hero Twins saw what was happening and decided to slay the monster. On their way, they met Grandmother Spider who warned them of the danger they would encounter. Grandmother Spider devised a plan to permit the Twins to get close enough to the giant to kill him. She would weave a web over his eyes so that he could not open them. Because the giant could not open his eyes, the Hero Twins struck and killed the giant and then threw his body over the high cliff where he had thrown so many others. Now the clouds could pass again over the mountain. The snows returned to the mountain, the rains came from the west, the mist formed in the east, and the springs filled in the south.

...

This myth, which illustrates the necessity of water to the Circle of Life, can lead to a class discussion on the following questions: In what ways is water important in your life? Can anyone own the water? Would you take water that someone else needed? How would you feel and what would you do if someone took your water away from you?

Hydrogen bonding between water molecules and other substances make life possible. Water is a polar molecule with positive and negative charges that attract each other, or attract the oppositely charged portions of other water molecules resulting in the formation of hydrogen. See illustration.

Polar substances are either hydrophilic (water loving) or hydrophobic (water dreading).

Shake a bottle of water containing water and salad oil and pour it on a counter. The water and oil have little attraction for one another. Hydrogen bonds unite the water molecules. Bonds are formed and the oil is forced to form droplets or to form a film on the surface of the water.

Hydrogen bonds and hydrophilic interactions underlie three properties of water that are very important. They are temperature stabilizing effects, cohesiveness and solvent properties. Liquid water resist rupturing when it is stretched. When water and air meet at a surface, hydrogen bonds exert a constant inward pull on the uppermost water molecules. This action creates a high surface tension. Surface tension is most important to all animals because it is the major property of the moisture in the lungs.

STUDENT LEARNING ACTIVITIES:

1. Give every two students an eye dropper, a penny, glass 1/2 full of water (use 8 oz. tumblers), and paper towel. Students are to place the penny on the paper towel, then one person drops water from the eye dropper onto the surface of the penny-the other student counts drops until the tension is broken. Repeat the activity three times.

Discuss why the difference in the count.

2. Give every four students one 8 oz. glass (plastic) tumbler and 1 box of paper clips. Fill glass with water to the brim of the glass. Have students estimate the number of paper clips that can be put in the glass without destroying the surface tension. Students should begin slipping paper clips into the glass of water, keeping a data chart with predictions and actual count which students will use to make comparisons. Have students form a hypothesis to explain the phenomena.

3. Water flowing out of a tap in a steady stream forms a smooth tube. Surface tension keeps the water in this shape. Try pouring water down a string to see this effect for yourself.

- a. Tie one end of the string to the handle of the jug with water.
- b. Pass the string over the lip of the jug and hold the free end.
- c. Separate the jug and the container so the string is pulled tight.
- d. Hold the jug right above the container and pour slowly and carefully. The water should flow down the string into the container.
- e. After the flow has started, move the jug down so it is at an angle. Surface should hold the water close to the string so it flows.

Discuss with students why this experiment works and what conclusion they can make from it.

4. Fill a bowl with water and gently lower the basket onto the surface of the water (the basket should float). Take a small piece of tissue and drop it lightly into the basket. The tissue slowly soaks up water, and the basket should sink suddenly.

Students should explain why this action occurs. (The basket floats because surface tension acts like a skin and stops the water from pushing up through the holes. The tissue slowly soaks up water breaking the tension and the basket sinks.)

5. Have students predict what will happen when the pull of surface tension is weakened.
 - a. Choose a large, clean plate(for six students).
 - b. Fill the plate with water and wait until the surface is smooth and still; sprinkle talcum powder over the surface
 - c. Wet one finger and rub it over a piece of soap, then dip a finger in the water at one side. All the talcum will be drawn immediately to the other side of the plate.

Explanation: Soap weakens the pull of surface tension in the water around the finger. The pull from the opposite side of the plate is stronger and the talcum is drawn to that side.

6. Research, report, and discuss the problems associated with drought and the solutions that people in water scarce regions use to overcome the drought.
7. Research, report, and discuss the problem of water rights as they pertain to the Native American tribes and make make suggested solutions to the problem.



8. Create the sounds of an imaginary rainstorm. Arrange students in a semi-circle. Let students discuss rainstorms and Navajo beliefs concerning female rain, which is the gentle, steady rain, and the male rain, which is loud, violent, and sporadic.

The students will work together to make a storm by imitating the teacher who walks in front of them, making a sequence of sounds. Each time the teacher begins making a different sound, he or she will start on one side of the group and walks across the front to the other side, and then return to the starting point to begin the next sound. Ask the students what part of a storm they are making with each motion. The sequence of representative sounds and actions are:

- | | | |
|----|-------------------------|---|
| 1. | wind | rub hand gently |
| 2. | drizzle | snap fingers or tap fingernails on desk |
| 3. | hard rain | slap your hands on your thighs |
| 4. | thunder | claps, stamp feet |
| 5. | hard rain | slapping hand on thigh |
| 6. | drizzle | finger snapping |
| 7. | wind | rub hands together |
| 8. | Stop movement abruptly. | |

Discuss with students the ways in which this dramatization demonstrated a storm. How would they demonstrate a rainstorm? Cooperative groups should research what causes rain storms and how they would demonstrate a rain storm.

9. Form a circle on the floor and sit with their eyes closed. They should relax and clear their minds of any thoughts. The instructor reads the following (or a similar) story:

Pretend that you are a dust particle. A strong wind is blowing across the land and you are a tiny bit of dust that has landed on the stalk of dry grass by the side of a stream in an arroyo. You are wondering if you will ever get unstuck from that dried up grass stalk.

The wind blows harder and harder causing the weed stalk to wave and bend. Suddenly, you are thrown off and are blown toward a large stand of cottonwood. Just before you crash into the trees, you are lifted high up into the sky.

As you rise higher and higher, you feel light as a feather. Down below, the vehicles looked like little ants and the arroyo looked like dots on the surface of Mother Earth. The strong wind carries you into a dark gray cloud. You hear a loud cry and almost crash into a large blackbird with a white head. Here in the cloud there are millions and billions bouncing dust particles rushing around and crashing into one another. "Look out! Watch it!", you yell as a very careless piece of dust bumps into you. You say, "Ouch! It's too crowded in here!"

It is very wet in the cloud and some water vapor begins to cover you, turning you into a tiny droplet of water. Soon you become too heavy and start to fall back to Mother Earth. All around you other rain drops are falling. Down and down you sink. In every direction you look are raindrops. The whole earth seems to be wet. You can't tell where you are going. You ask yourself, "where and when will I land?"

EVALUATION:

Written activities should be checked for accuracy and then graded. The following questions should be asked as part of class discussion:

1. How are raindrops formed?
2. Are there any harmful raindrops? If so, investigate the causes for those raindrops.
3. How can we make our raindrops better environmentally?

RESOURCES:

Caduto, Michael, and Joseph Burchac. Keepers of the Earth. Golden Colorado: Fulcrum, Inc., 1988.

Walpole, Brenda. 175 Science Experiments. New York: Random House

DEVELOPED BY:

Ivadene Dhority
Grover Parsons

MATHEMATICS S AND SCIENCE --

WATER ABSORPTION AND RELEASE

CULTURAL OUTCOMES: I, II, IV, V,
VI, VII, VIII

MATH OUTCOMES: I, III, IV, V,
VI, VII, VIII

SCIENCE OUTCOMES: I, VI

CULTURAL OBJECTIVES:

Students will:

relate culturally relevant plants, trees, foods, and their soils to the processes of moisture capacity, transpiration, and dehydration

recognize and appreciate the unique lifestyles of their tribes including food preparation

MATH OBJECTIVES:

Students will:

read and convert metric to standard measurements of mass, length, and width.

record and graph data for outcomes of various experiments.

calculate differences, area, percents, and ratios.

estimate long term outcomes (per year).

solve for the variable in an equation.

SCIENCE OBJECTIVES:

Students will:

review the water cycle process.

collect, analyze, and interpret data on specific native plants, trees, foods, and their soils concerning moisture capacity, transpiration, and dehydration.

compare and estimate percents of water composition in cultural foods, plants, trees, and their soils.

observe the processes of transpiration and dehydration.

identify and/or define pertinent vocabulary words.

compare and make generalizations about specific soil areas, leaf sizes, leaf shapes, and specific foods.

STUDENT LEARNING ACTIVITIES:

ACTIVITY 1: TRANSPIRATION

TEACHER'S BACKGROUND INFORMATION:

Plants lose water through their leaves through a process called transpiration. Large quantities of water are released into the atmosphere through this process. A mature maple tree, for example, may give off as much as 15 liters of water in a single hour.

The amount of water you collect will depend on weather conditions. If dramatic results are obtained, observations and measurements may be taken several times a day. If the amount of water is too small to measure, the experiment may be continued over several days.

Materials:

Graduated cylinders
Pebbles
Centimeter grid paper

Plastic bags
Rubber bands
Pencil/paper

Procedure:

1. Hypothesize: "Does the size of a plant and its leaves affect the amount of water given over a set amount of time?"
2. Collect from outdoors, several culturally important plants.
3. Discuss the cultural values of the plants selected: Foods, arts, medicines etc.
4. Select a small branch with several leaves and cover them with a plastic bag. Record the time at which the leaves were covered.
5. Place a pebble in the bag to force the bag to droop so moisture can be collected in the low area reservoir. Close the opening with a rubber band.
6. As results are visible, record time, uncover and measure the amount of water in a graduated cylinder.
7. Record results, compare the amount of water from different plants.

Suggested Table:**TRANSPIRATION TABLE****Plant name:****Width cm:****Length cm:****Area:****Start time:****End time:****Total time:****Amount of Water:****Amount of Water per Day:****Amount of Water per Year:**

Note:

1. # of leaves on a branch: A. _____
2. # of branches on a plant: B. _____
3. Approximate # of leaves per plant; $A \times B = C$ _____
4. Amount of water from 1 leaf in 1 day $\times C$ equals amount of water from whole plant in one day. _____

EVALUATION:

1. Conclude if the leaf's size seems to have an effect on the amount of water given off by a plant?
2. Determine if the size of the plant contributed to the amount of water given off through the leaves?
3. Explain where the water comes from?
4. Count the number of leaves on a single branch. Multiply by the number of branches on the plant and estimate the approximate amount of water released by that plant during a single day.

ACTIVITY 2: DEHYDRATION

TEACHER'S BACKGROUND INFORMATION

Foods aren't always as they appear, it will be surprising to find that the amount of water contained in foods is at least 50%.

Materials:

Knife	Plastic wrap
Aluminum foil	Gram scale and masses
Oven or dehydrator	A student worksheet
Part of, or the entire food to be tested	

Procedure:

1. Hypothesize: "How much of the selected food is water?"
2. Break into 4 - 9 groups.
3. Have each group arrange their foods according to the greatest to smallest % of water content using inequality symbols?
4. After ranking foods, each group estimates % of water for every food.
5. Take a square aluminum foil pan - 15c, pr 6" (weighs approx. 1g.)
6. Slice food 3mm thick and cover bottom of pan with no overlapping.
7. Weigh pan of food & record as beginning mass.
8. Place in oven or dehydrator at 65° C or 150° F for 8 to 10 hours.
Note: Food will not be edible.
9. Leave oven door ajar.
10. Weigh again when dry.
11. Calculate difference to find amount of water lost.
12. Complete table and graph bar.
13. Compare initial estimates to actual guesses.

Suggested Table:

Include:

Beginning Mass (g)
Final Mass, after drying (g)
Loss of Mass, (water) (g)
Ratio = Loss of Mass / Beginning Mass (L/B)
Percentage of Water (%)

Suggested Bar Graph:

Include:

Sample foods
% amounts of water

EVALUATION:

1. Compute as determined by the price of the piece of fruit/vegetable, how much you've paid for the water in the product.
2. Conclude why the oven door is left ajar & why the dehydrators have vents?
3. Decide which food has the most surprising results and state why?
4. Compute price of water in each food used.
5. Transfer this experiment to meat products to determine their composition of water.
6. Explain why dehydration was an important process for the Native American culture and how we still use it in the present.

ACTIVITY 3: MOISTURE CAPACITY OF VARIOUS SOILS

TEACHER'S BACKGROUND INFORMATION:

A soil's ability to absorb and retain water are key factors in its ability to halt erosion and support plant life. Soil is made up of very small particles of rock, plant, and animal materials that were once part of larger pieces. The size of the particles can be classified into sand, silt, or clay. This varying make-up of the soil composition is the key factor in the retention of moisture. Soil should be dry prior to the activity. If weather conditions prevent soil from drying outside, drying may be done on low heat in the oven. Retrieve soil samples from various location: i.e., football field, yard, garden, reservation, lake areas, etc.

Procedure:

1. Hypothesize: How much water can these soil samples retain before becoming saturated?
2. Form 4 - 10 groups.
3. Give each group a different soil sample, but all samples should weigh approximately the same amount.
4. Weigh soil samples with coffee filter on a balance and record on table.
5. Place coffee filter & sample into a coffee can with a perforated bottom.

6. Set the can on top of a quart jar & carefully pour 500 ml of water into the can.
7. Let water settle. Remove the can and measure the water in the jar by pouring it back into the graduated ml container. Record the difference and calculate the percent of water that has been retained by the sample. $100\% - \text{measure \%} / \text{poured \%}$.
8. Remove the filter with the sample and weigh to calculate the weight & percent of water retained.

EVALUATION:

1. What samples held the most water?
2. Compare geographical location of soil samples
3. State some properties of the higher quality soils
4. Rank the soil from greatest to least, according to soil volumes. Remember, all the samples weighed approx. the same amount.
5. Relate why soils ability to hold water is a factor in erosion?

Extension:

1. Select various soil samples from different habitats (need not be dried).
2. Place soil samples into different graduated cylinders. (Note & record amount of soil.)
3. Fill with water and shake.
4. Record time as sample settles.
5. Check amount settled out after 1 min., record & divide for % age.
6. Repeat process after 10 minutes.

Sand settles in 1 minute or less.

Silt settles by 10 minutes.

Clay settles after 10 minutes.

Example:

After 1 minute, 30 ml was measured, so $30/40 = 75\%$ of the sample is considered sand.

After 10 minutes, almost all was settled, but water was somewhat cloudy: $\frac{39}{40} = 97\%$, before 75% sand, 22% silt, 3% clay.

Suggested Table:

Include:

Type or Location (Description of sample)

(x) Sample Mass g

(Y) Saturated Soil Mass

(A) ml Water added

$(Y - X = Z)$ Water Mass in Soil

(B) ml Water Recollected

$(Z \div Y = \%)$ % of Water in Soil

(A-B) ml Water Absorbed

Suggested Table for Extension: Composition of Soil Sample

Include:

(X) Total Sample

(A) Sand (in 1 min.) ml

(A/X) Sand (in 1 min.) %

(B) Silt (in 10 min.) ml

(B/X) Silt (in 10 mins.) %

(C) Clay (over 10 mins.) ml

(C/X) Clay (over 10 mins.) %

ACTIVITY 4: EVAPORATION/TRANSPIRATION

TEACHER'S BACKGROUND INFORMATION:

All plants lose water through evaporation. The majority of this evaporation occurs through the leaf surfaces, but water is also lost through all of the plant surfaces.

The states of evaporation depend on several variables. Transpiration increases in dry air and decreases in moist air. Consequently, plants lose more water on hot dry days rather than cool, moist nights. Windy conditions also increase transpiration rates by evaporating the moisture around plants more quickly and carrying it away to be replaced by drier air.

Generally, plants with non-waxy leaves have higher rates of water loss.

Plant wilting is related to transpiration. Protoplasm consists mostly of water. A plant's stiffness depends on the pressure of protoplasm against the plant cell walls. When transpiration causes the plant to lose more water than it can replace, wilting occurs because of the weak protoplasm pressure. This is seen as loss of rigidity or plant wilting.

Three sets of reading can be taken on successive days. Prior to each test refill the pipette or syringe. Conducted in this manner the experiment will take at least four 1 hour periods.

Materials:

- | | |
|--|------------------------------------|
| Two hole stopper (to fit flask) | Glass tubing, bent to a angle |
| Large bowl | Solid glass rod |
| Knife | Rubber tubing about 20cm long |
| Erlenmeyer flask, 500 ml | Oil based clay |
| Pipette (1/10 ml calibration) | Cork \Water at room temp. |
| Burette clamp | Ring stand |
| Clock | Graph paper, one sheet per student |
| Pencils, 3 colors | Plastic bags and ties |
| Small fan | Food coloring |
| Leafy shoot (1 per group—leafy chrysanthemum with white bloom) | |

Procedure:

1. Place the pipette in the cork.
2. Place the bent glass tube into the two hole stopper.
3. Place one end of the rubber hose onto the glass tube.
4. Seal around the glass tube with clay.
5. Place the Burette clamp onto the ring stand.
6. Teacher should also set up the control experiment using the solid glass tube instead of the leafy shoot.
7. Place the leafy shoot under water and cut off about 2cm of the stem.
8. Keep the cut end of the stem underwater as you place the stem into the empty hole of the stopper. The stem should fit snugly into the hole.
9. Fill the flask and rubber tube with water and add food coloring to the water. Hold tube pinched so water does not drain out.
10. Quickly place the stopper into the filled flask so that water runs up into the glass tube. Some water will overflow. Keep rubber tube pinched to keep it filled with water.
11. Seal the stem into the stopper with clay.
12. Fill the pipette with water and place it into the open end of the rubber tubing.
13. Fill the pipette with water and place it into the open end of the rubber tubing.
14. Clamp the pipette onto the stand.
15. Record the level of water in the pipette and time the reading was taken.
16. Take reading every 5 mins. until 8 readings are recorded.
17. After the eight reading begin fanning the leaves. Keep up a constant fanning while readings are taken every 5 minutes until 8 more readings have been taken.
18. After the 16th reading, loosely cover the leafy shoot with a plastic bag. Tie the gathered bag around the stem at the bottom. Take readings every 5 mins. until another 8 readings have been taken.
19. Graph your results using a line graph. Use colored lines to represent each phase of the experiment.
20. Leave the experiment for a day and then observe the results.

EVALUATION:

1. Explain what happened to the flower and why.
2. Compare the water loss with the results of the control experiment.
3. Discuss why fanning the leaves effect the water lose.
4. Describe why we sealed the connections of the experiment.
5. Compute the amount of water lost in your shoot after an hour of being left in the bottle.
6. Calculate the amount of water a plant with 50x's the number of leaves as your shoot lose in an hour if not covered or in a breeze.
7. Analyze what happened to the plant when we took it out of the ground and discuss why.
8. State what weather conditions are best for the survival of plants if they are transplanted and why.
9. Describe what happens to a plant when we leave it in the sun and give it no water.

Suggested Table:

Include:

Time increments of 5 minutes, beginning with 0 and ending at 40 minutes.

Shoot uncovered

Shoot fanned

Shoot covered

Suggested line graph(table results:)

Include:

Time in minutes

Water in 1/10 ml

ACTIVITY 4: DEHYDRATION (SUN DRYING METHOD)

TEACHER'S BACKGROUND INFORMATION:

Dried foods have no expiration date. Sun energy, when used instead of an oven or a dehydrator, is absolutely free. For immediate use it is not necessary to sulfur or treat food. Sulfuring is done as a color preservative. Dips, such as lemon, honey or ascorbic acid are used for the same purpose. Never put sulfured food in an oven or a dehydrator. Fruits are dry when leather or crisp and not wet or moist when squeezed.

If you have a convection oven which you can bring to school it can be done as a school activity.

Materials:

Fruits to be dried
Cheese cloth

Drying trays--wood, stainless steel, window screen
Knife

Procedure:

1. Select whatever foods or materials which are available for drying. Fruits make better snacks than vegetables. Available fruits are apples and grapes in the fall, and in the spring there might be some early apricots, peaches, or plums. Bananas are available all year round.
2. Select fully ripe fruit.

Sun Dry Method For Fruits:

1. Leave grapes whole either in bunches or separated.
2. Place on tray, cover with cheese cloth, dry on one side, turn and dry the other side (6-10 days).
3. Fruits should be covered at night to protect them from dew.

Sun Dry Method For Meats:

1. All meats should be cooked, except for when making jerky.
2. Leftover meats (poultry, beef, ham and lamb) are good choices for drying.
3. Trim off *all* fat, since it will turn rancid in time, and spread a single layer on trays, and dry until hard (2-3 days).

EVALUATION:

1. Discuss value of dehydration as a way of preserving foods for future use.
2. Compare it with freezing and canning for ease and storage space.
3. Discuss energy use in various methods.

Extension:

1. Experiment with Sun Drying Method for culturally related materials such as, corn, hides, cedar wood, Juniper seeds, and medicine plants.

SCIENCE STANDARDS ADDRESSED IN WATER UNIT –

Standard – Understands that scientific inquiry works in particular ways

Benchmarks –

Understands that preventing the influence of outside factors is often difficult, and that research designs should be examined for their presence

Standard – Understands the main individual, social, ethical and institutional aspects of science

Benchmarks –

Understands that scientists and science technicians are employed in education, government, business, and industry; they work in offices, classrooms, farms, factories, and in field settings

Understands the value of computers for speeding up and extending the ability to store, compile, analyze and share data; to prepare research reports, and share ideas with others

Standard – Knows basic concepts about the earth

Benchmarks –

Knows that three-fourths of the earth's surface is covered by a thin layer of water

Standard – Understands how species depend on one another and on the environment for survival

Benchmarks –

Knows that ecosystems can be described as systems in which organisms compete for finite resources, including food, space, light, heat, air, shelter and water.

Knows the physical characteristics of lakes, oceans, rivers and ground water and their relation to habitats for plant and animal life

Standard – Understands how germ theory differs from earlier notions about what causes illness and how germs were discovered and linked to disease

Knows that the modern approach to disease control emphasizes sanitation and includes the safe handling of food and water.

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED –

Life Science

Indian students should develop an understanding of immune system factors which led to the devastating effects of European-based diseases on American Indians

History and Nature of Science

Indian students should develop an understanding of examples of Indian men and women with diverse interests, talents, qualities, and motivations who currently engage in the activities of science, engineering and related fields.

INDIAN ART

There are artists in every Indian tribe. This has always been the way. Every tribe probably had something only they made – a special way of showing their artistic talent. Indian people used things in their natural environments to make art objects. That's one reason Indian art is not the same in one place as it is in another. Over the years culture groups borrowed from each other. Indian artists are still at work making things that tell us about their tradition. Some Indian artists are borrowing from the art of the past or from other tribal groups to create something brand new. Pieces of Indian art help us understand what cultures were like and are like today. Indian people have found many ways to express their love of beauty and their creative talents.

LITERATURE FOR INDIAN ART UNIT –

Forbidden Talent by Redwing Nez (**Indian Author**), Northland Pub., 1995. **Navajo**

The Ledgerbook of Thomas Blue Eagle by Gary Matthaei. **Lakota**

This Land Is My Land by George Littlefield (**Indian Author and Artist**).

Native Artists of North America by Reavis Moore.

Patrick Desjarlait: Conversations with a Native American Artist by Patrick Desjarlait (**Indian Author and Artist**), Runestone Press. **Ojibwa**

Oscar Howe by John R. Milton, Dillon, 1972. **Lakota**

Michael Naranjo by Mary C. Nelson, Dillon, 1975. **Pueblo**

George Morrison, **Chippewa** Artist, Dillon.

Pablita Velarde by Mary C. Nelson, Dillon, 1972. **Pueblo**

Maria Martinez by Mary C. Nelson, Dillon, 1972. **Pueblo**

Daisy Hooee Nampeyo by Carol Fowler, Dillon, 1977. **Pueblo**

Contemporary American Indian Artists by Dawn Reno.

R. C. Gorman-**Navajo** Artist, Available from Four Winds Books, York, NE.

Tending the Fire, The Story of Maria Martinez by Juddi Morris. **Pueblo**

Where There Is No Name for Art by Bruce Hucko. **Pueblo**

Navajo Visions and Voices Across the Mesa by Shonto Begay (**Indian Author**), Schol.

Rainbow at Night by Bruce Hucko. **Navajo**

American Indian Beadwork by W. Ben Hunt.

Indian Designs by David Villasenor.

Sea and Cedar by Lois McConkey, Firefly, 1973. **Northwest**

The Button Blanket, a **Northwest** Coast Activity Book.

Bentwood Box Activity Book, A **Northwest** Coast Activity Book.

How to Make a Native American Dance Shawl. Video

Shannon, an **Ojibway** Dancer by Sandra King (**Indian Author**), Lerner.

Songs from the Loom – A **Navajo** Girl Learns to Weave by Monty Roessel (**Indian Author**), Lerner. We Are Still Here Series.

Weaving a **Navajo** Rug by Begay Students, Chinle, AZ.

Morning Star Quilts by Florence Pulford.

The Star Quilt, a Symbol of **Lakota** Identity by Marla N. Powers, Lakota Books, 1990.

Simply **Seminole**: Techniques and Designs in Quiltmaking by Dorothy Hanisko.

Weaving, a **California** Tradition by Linda Yamane (**Indian Author**), Lerner. We Are Still Here Series. Basket Making

Nesuya's Basket by Carol Purdy, Montana Council for Indian Education. **Maidu**

Waw Giwulk: Center of the Basket, **O'odham**, and The First Basket, **Mandan**, in Keepers of Life by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1998.

A First Clay Gathering by N. Naranjo- Mores, 1994. **Pueblo**

Children of Clay – A Family of **Pueblo** Potters by Rina Swentzell (**Indian Author**), Lerner. We Are Still Here Series.

Helen Cordero and the Storytellers of **Cochiti Pueblo** by Nancy Shroyer Howard, Davis Pub., 1995.

This Song Remembers: Self-Portraits of Native Americans in the Arts ed. by Jane Katz, Houghton-Mifflin, 1980.

All My Relations: Sharing Native Values Through the Arts by Catherine Verall and Lenore Keeship-Tobias. Canadian Alliance in Solidarity with Native Peoples, 1988.

Dolls and Toys of Native America by Don and Debra McQuiston.

Indian Dolls by Nancy N. Shiffer.

There are many Indian art books for adults that contain pictures of art items.

ACTIVITIES FOR INDIAN ART UNIT –

1. Have the students learn about Indian art, read cultural materials and hear cultural perspectives relating to this topic, and experience Indian art through observation and projects.
2. Have the students research Indian art objects and their history from the local tribe(s). Who are some of the tribal artists?
3. What science was utilized in the making of those art objects? What math was utilized? What math is utilized in marketing art objects?
4. Have students develop a display, based upon the above, for the Tribal office building. Assign students various parts of the display.

Following are example activities developed by teachers of Indian students who attended math and science workshops during 1992-1994 at Haskell Indian Nations University. Adapt these activities to meet the needs of your students. Review the science standards for this unit. They will suggest further science and math activities. Also utilize the activities in *Keepers of Life*.

MATH --

"PICTURE THIS"

CULTURAL OUTCOME:
MATH OUTCOME:

VII, X
I, IV

CULTURAL OBJECTIVE:

Students will relate a Native American legend to a mathematical coordinate system and find out the tribal or regional origin, meaning, and uses of Native American designs.

MATH OBJECTIVES:

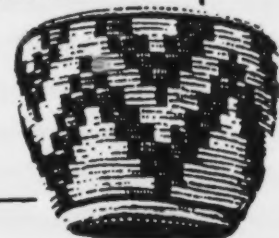
Students will:

- determine the pattern for a given number sequence
- compare and rank in order positive and negative values
- explore linear relationships graphically using graph paper
- using symmetry in two and three dimensions, describe geometry in the world of art, nature and construction.

TEACHER'S BACKGROUND INFORMATION:

Native American people use unique designs on the objects they make. These designs often represent natural objects, animals, and phenomena of nature. They decorate their clothing, beading, baskets, and art. Many designs are traditional and have been used for a long, long time.

Many designs are created by a person and are non-traditional. Many tribal designs are abstract symbols representing real-life objects (e.g. weather symbols, animal symbols, mountains, trees, etc.). Indian designs have also been used in non-Indian arts, crafts, etc. Some designs were used in tattooing, face painting, rugs, and quilts. Different social and religious values are expressed as well as the order and harmony of life and the universe.



Chitimacha baskets have been called the "Chief Glory" of this tribe located in the bayou country of southern Louisiana. The cane (piya) is gathered by the basket weaver from the swamp. The cane is split and dyed using red or black colors derived from certain plants. After drying the strips, they are woven into baskets doubling the strips producing symbolic designs. At the present time, only a few basket weavers are left and only one who still makes double-weave baskets. These baskets are collected and are very expensive.

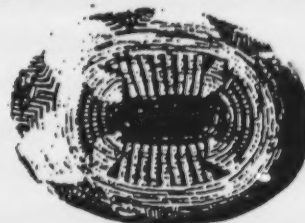
STUDENT LEARNING ACTIVITIES:

1. Tell the "Thunderbird Legend" (pp. 36-40, American Indian Design and Decoration, "The Origin of the Thunderbird Clan"). The legend states that when Earth-Maker created the world, he created a being in his own likeness out of clay. He liked what he had made, so he made three more just like him. He made them powerful so that they could watch over the earth. They were made chiefs of the Thunderbirds. Then he made four more beings. The brothers were Kunuga, Henaga, Hakaga, and Nangiga. Earth-Maker gave them instructions and had the thunder-spirits take the four brothers to earth. The oldest brother said he would call his first boy King (chief) of the Thunders. The thunder-spirits did not touch the earth. The first people to call on the four brothers were the War-People, the second were the Thunders, the third were those of the Earth-Dear Clan, Snake Clan, Elk Clan, Bear Clan, Fish Clan, Water-spirit Clan, and all the other clans that exist.

In the beginning the Thunder clansmen were as powerful as the thunder-spirits. The Thunder-People made the valleys and ravines with their clubs. This is the reason why the upper clans are chiefs of all others especially the lowest, the Dog-People. When the first man died, the Thunder-People thanked the four spirits (North, South, East, West) for explaining death to them and life after death. Ask how and why questions based on the actual legend (not this brief summary).

2. Have students label graph paper from -7 to 0 to +7 horizontally across the middle of the page using one color. Label +7 to 0 to -7 vertically down the middle of the page using a different color. The first integer of the ordered pair is represented by the first color. The second integer of the ordered pair is represented by the second color.

Have students plot the coordinates on their graph paper which will display a thunderbird. A copy is attached.



3. Use graph paper to create American Indian (traditional) symbols. Have design books available for the use of the students. They will write the coordinates for other students to plot on graph paper creating the traditional designed symbol (eg. feathers, tipis, arrows, etc.). Have students give tribal origin or regional origin, meaning and uses of each design.
4. Have students write coordinates to create Chitimacha basket designs for other students to plot. Patterns attached.
5. Students can create their own personal (original) designs. Write the coordinates for other students to plot. The creator should be able to give the meaning and applications for each design.

EVALUATION:

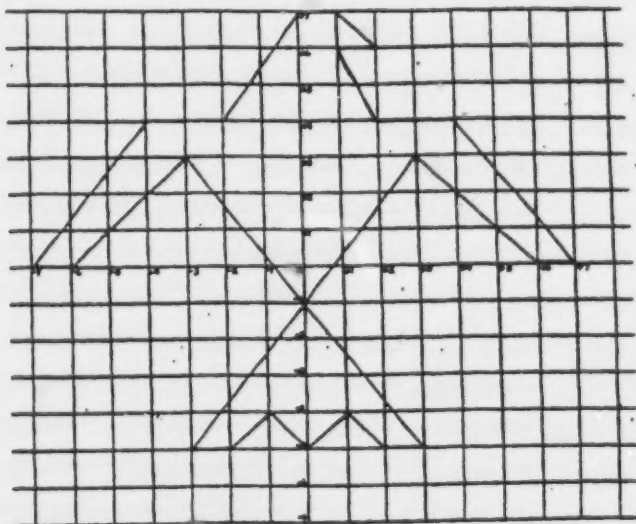
Students will compile a "Design" booklet to be graded by the teacher.

RESOURCES:

Appleton, Leroy H. American Indian Design and Decoration. New York: Dover Publications, Inc., 1971

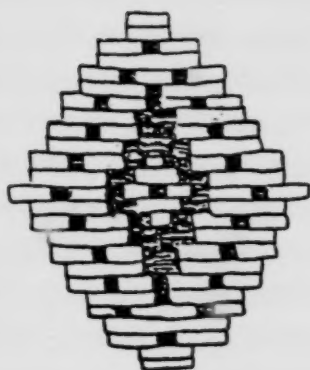
DEVELOPED BY:

Phyllis Darden
Grover Parsons

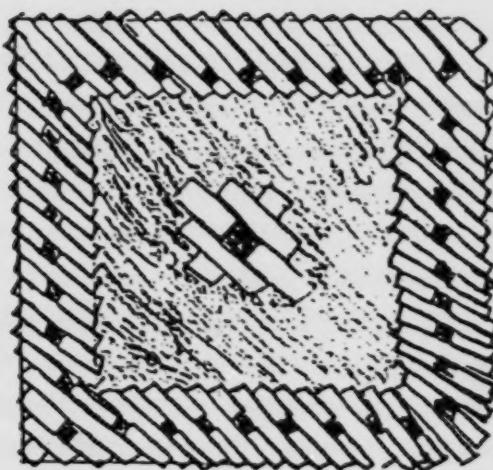


PLOT THE COORDINATES:

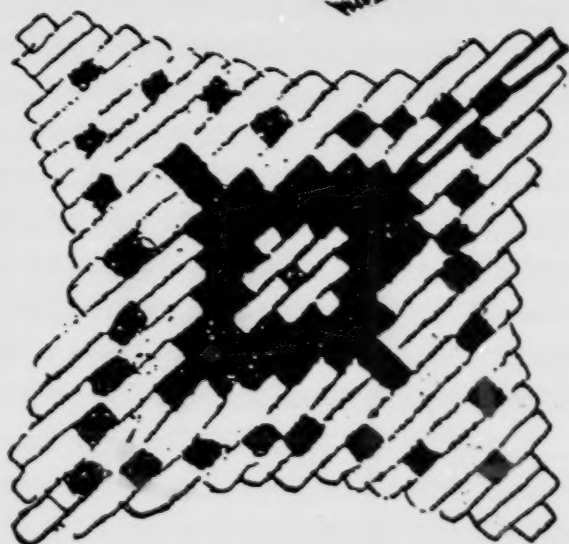
1 (+7, 0)	2 (-2, +4)	15. (+2, -5)	22. (+3, +3)
2. (+4, +4)	9. (-4, +4)	16. (+1, -4)	23. (+4, 0)
3. (+3, +4)	10. (-7, 0)	17. (0, -5)	24. (+7, 0)
4. (+1, +6)	11. (-6, 0)	18. (-1, -4)	
5. (+2, +6)	12. (-3, +3)	19. (-2, -5)	
6. (+1, +7)	13. (0, +1)	20. (-3, -5)	
7. (0, +7)	14. (+3, -5)	21. (0, -1)	



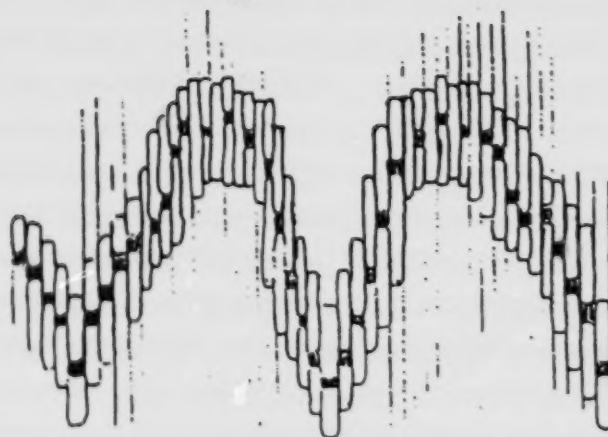
LITTLE TROUT
MAKE-NAKE



BIG BLACKBIRD'S EYE
TCEXT-KANI*-A'TXIN

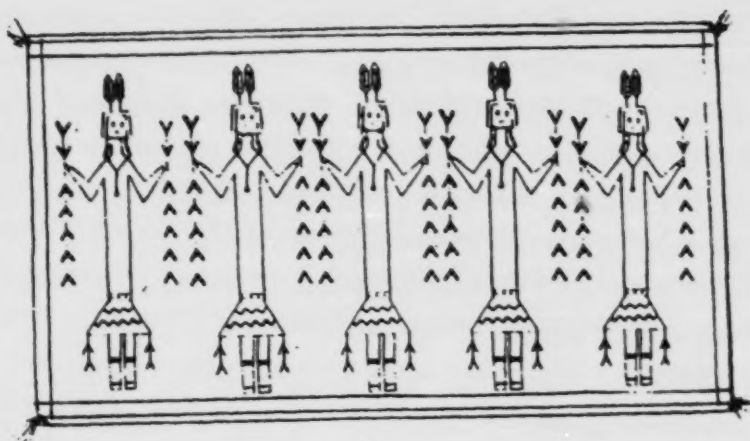
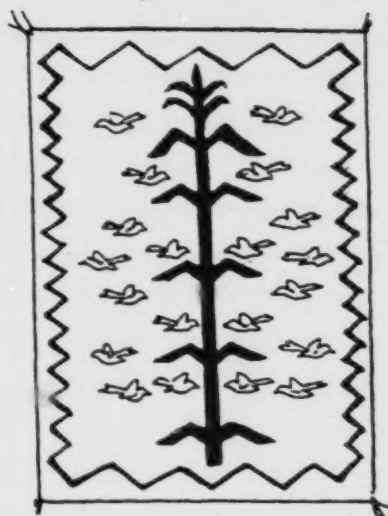
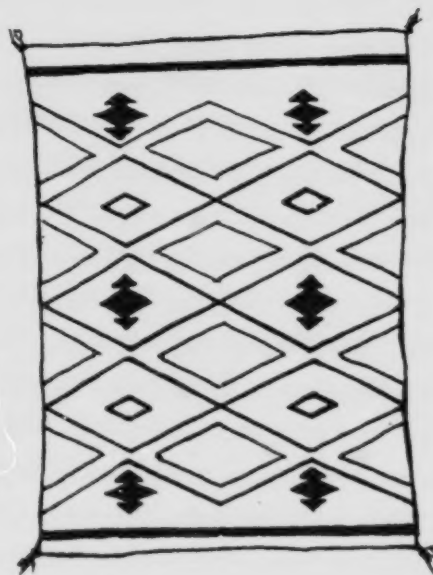
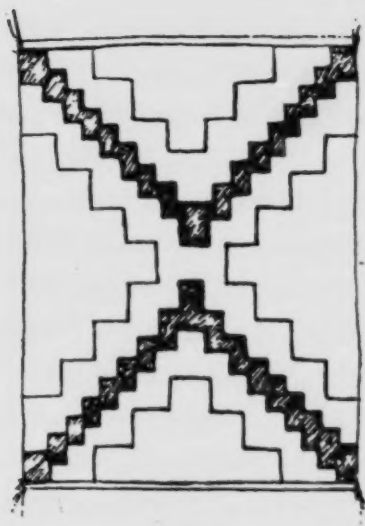


MUSCADINE RIND
KO SPI SUU



TURTLE WITH ANECKTIE
NABE KAKI' TE

Rug Designs





Art

Make Your Own Mini Navajo Rug

Objective:

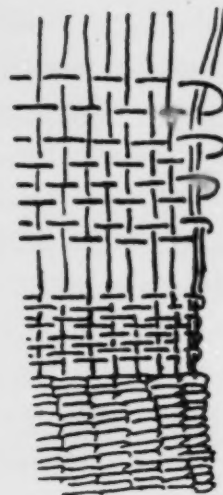
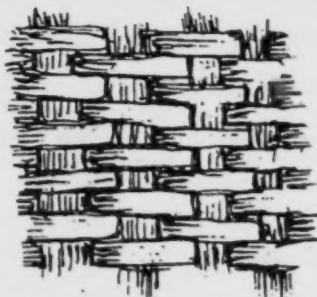
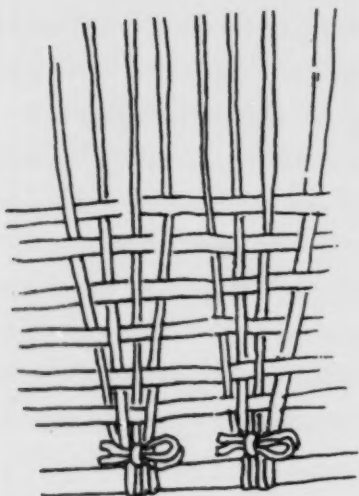
Students will make their own mini Navajo rug thus building on the information learned in the previous lesson.

Materials:

- cardboard rectangle (sized to fit patterns on previous lesson)
- yarn (colors as needed for designs)
- yarn needles (one for each student)
- copies of Navajo rug designs

Procedure:

Have students study several Navajo rugs or pictures of Navajo rugs. Then, students learn how to weave their mini rug. First, choose one color of yarn to wrap around the cardboard lengthwise covering the entire frame; this is the warp. Notches may be cut in the top and bottom of the cardboard to help secure the yarn. Choose a simple pattern such as stripes. Cut about a two foot length of a different color yarn and thread it through the needle. Beginning at the top pass the needle alternating over and under the warp threads. Begin passing the needle from left to right. With the first horizontal weave, leave a two inch tail dangling to tie off later. With your fingers push the woven thread, the woof, to the top of the card. Continue with the next row passing right to left. Continue to the bottom of the pattern. If you need to tie on more thread, hide the knot on the back of the weaving. Continue with the next color thread. Once you have finished, cut down the center of the back yarn. Knot the ends close to the weave. Weave the loose ends to the edges of the rug.





SCIENCE STANDARDS ADDRESSED IN INDIAN ART UNIT –

Standard - Understands basic concepts about the structure of matter

Benchmarks –

Knows that matter is composed of elements, compounds (the combination of two or more elements) and numerous mixtures of these two kinds of substances

Knows methods used to separate mixtures into their component parts (boiling, filtering, chromatography, screening)

Knows that an enormous variety of biological, chemical, and physical phenomena can be explained by changes in the arrangement and motion of atoms and molecules

Standard – Knows the forms energy takes, its transformations from one form to another, and its relationship to matter

Benchmarks –

Knows that energy changes involved in physical or chemical changes can be measured in the form of heat

Standard – Understands the nature of the Chemical Revolution

Benchmarks –

Knows that alchemy, an effort to change base metals like lead into gold was practiced for centuries but produced very little understanding of the nature of materials and how they react with one another; although the main purpose of basic chemistry is knowledge for its own sake, it has led to the development of practical new materials undreamed of by the alchemists

AMERICAN INDIAN SCIENCE STANDARDS ADDRESSED IN UNIT-

Science as Inquiry

Indian students should develop the ability to articulate examples of scientific inquiry necessary to develop and improve technologies employed by early American Indians such as tempered pottery.

Physical Science

Indian students should develop an understanding of the principle of changes of properties applied in the daily activities of early Indians, such as evidenced in the preparation of wood splints for basketry, the production of glue from the hooves of a deer, and the preparation of natural dyes.

History and Nature of Science

Indian students should develop an understanding of ways in which reasoning, insight, energy, skill and creativity were demonstrated in scientific achievements of early American Indians.

▲ Background ▲ Materials
▲ Activities ▲ Standards



for Social Studies/History-Based Units

HISTORY/SOCIAL STUDIES

The units on history/social studies will help Indian students understand their backgrounds and realize their rich cultures and uniqueness.

Many states require that information on Indian history/culture of the tribes in that state be taught sometime in the intermediate grades. For this purpose, the materials focusing on the various tribes for the first unit will be helpful. They should be coupled with other available resources - written, audio-visual and human - to verify information and to provide for a complete study of the state's tribes, with emphasis on the local tribe(s). The study of general Indian history can be taught at one or both of the other grades. Or perhaps students can learn about their own tribe one year, about the other tribes in the state another year, and general Indian history by itself or woven in with regular history a third year, or some other variation. In any case, it is recommended that the teacher utilize some of the following resources for the teaching of general Indian history:

Indian Country: A History of Native People in America by Karen D. Harvey and Lisa D. Harjo (**Indian Author**), North American Press, 1994.

The Encyclopedia of Native America by Trudy Griffin-Pierce.

Timelines of Native American History by Carl Waldman, Prentice-Hall, 1994.

North American Indians by Herman Viola.

Lasting Echoes: An Oral History of Native American People by Joseph Bruchac, 1997.

A Time for Native Americans, biographical card games, Four Winds books, York, NE

A to Z of Native American Women by Liz Sonneborn.

Extraordinary American Indians by Susan Avery and Linda Skinner (**Indian Author**).

Maps of American Indian Tribes or of North American Indians or atlases available from Four Winds Books, York, NE.

ACTIVITIES FOR THE UNITS -

1. Engage students every way possible. "Read the chapter and we'll discuss it" is not a good way to teach. Neither is lecturing all the time. Chapters can be read aloud together, or parts of chapters - a chapter does not have to be read at one time. Students can be assigned to be responsible for reporting on various parts of a chapter or on various books. Books, chapters or parts of chapters can be read after discussion or other activities rather than only before.

2. Instruction should include field trips, guest speakers, projects, audio-visual aids, higher order thinking questions such as "What would you do if..?", and how happenings in history affect the lives of Indian people today.
3. Students can be provided questions for which they are to find answers by using various resources and give presentations with visuals indicating their findings.
4. Review the American Indian standards for U.S. History. The explanatory narratives included provide ideas for activities that make happenings in history relevant to the lives of individual Indian people and tribes today.
5. If a particular aspect of history, i.e. the Lewis and Clark expedition, had particular relevance to the local tribe(s), special research projects, interviews of elders, reenactments, making of videos, etc., should be included.

HISTORY/LIVES OF TRIBAL GROUPS

The following are to be used in a study of the tribes of the state and/or the local tribe(s).

Books by Virginia Driving Hawk Sneve (**Indian Author**), on various tribes, Holiday House. Title include The **Iroquois**, The **Navajos**, The **Nez Perce**, The **Seminoles**, The **Sioux**, The **Hopi**, The **Cheyennes**, The **Apaches**, and The **Cherokees**.

Indian Nations Series, Raintree (**Includes Indian Authors**) includes books on various tribes.

Indians of the Americas Series includes The **Abenaki**, The **Chilula**, The **Ottawa**, The **Tohono O'odham**, The **Potawatomi**, The **Algonquians**, The **Chippewa**, The **Pawnee**, The **Pueblos**, The **Wampanoag**, The **Cheyenne**, The **Creek**, The **Penobscot**, The **Seminoles**, The **Zuni**, The **Iroquois**, The **Pomo**, and The **Shawnee**.

Lifeways Series on American Indian tribes.

Indians of North America Series ed. by Frank W. Porter, Chelsea House. Includes many books on various Indian tribes.

First Americans Series by Facts on File includes **California** Indians, Indians of the **Plains**, Indians of the **Arctic and Subarctic**, Indians of the **Plateau and the Great Basin**, Indians of the **Northeast**, Indians of the **Southeast**, Indians of the **Pacific Northwest** and Indians of the **Southwest**.

Scholastic Encyclopedia of the North American Indian by James Ciment and Ronald LaFrance.

The **Choctaw** Nation by Allison Lassieur, 2001.

Navajo History by Ethelou Yazzie (**Indian Author**), Rough Rock, 1971.

The **Wampanoags** of Mashpee by Russell Peters (**Indian Author**), Indian Spiritual and Cultural Training Council, 1987.

Migration of the **Iroquois** by Ray Fadden, Tehanetorens (**Indian Author**), White Roots of Peace, 1972.

The **Zunis** by K and D. Doherty, Franklin Watts, 1993.

The Wabanakis of Maine and the Maritimes: A Resource Book about **Penobscot**, **Passamaquoddy**, **Matiseet**, **Micmac** and **Abenaki** Indians, AFSC, 1989.

The Mishomis Book: The Voice of the **Ojibway** by Edward Benton Benai (**Indian Author**), Red School House, 1979.

We Are **Mesquakie**: We Are One by H. Irwin, Feminist Press, 1980.

The **Yaqui**: A People and Their Place by F. S. Molina, Arizona Humanities Council.

The Story of the **Cherokee** People by Tom Underwood.

People of the Longhouse by Jillian & Robin Ridington.

People of the Ice by Jillian & Robin Ridington.

Indians of the **Northeast** by Colin G. Calloway.

Indians of the **Northeast** Woodlands by Beatrice Seigel.

The **Woodland** Indians by C. Keith Wilbur.

People of the Three Fires: The **Ottawa**, **Potawatomi** and **Ojibway** of Michigan with teacher's guide available from Four Winds Indian Books, York, NE.

Ojibway Family Life in Minnesota by Priscilla Buffalohead, Anoka-Hennipen Indian Education Program.

The Lasting of the **Mohegans**: The Story of the Wolf People by Melissa Jayne Fawcett (**Indian Author**), Mohegan Tribe, 1995.

Land of the Four Directions by Frederick J. Pratson, Chaatham, 1970. **Passamaquoddy**, **Micmac**, **Maliseet**

Inuit by Ulli Steltzer, University of Chicago, 1982.

The **Sioux** Today by Frank LaPointe (**Indian Author**), Macmillan, 1972.

Pochee Goyo: History and Legends from the **Shoshone** by Rupert Weeks (**Indian Author**), Jelm Mtn. Press, 1981.

From the Heart of the **Crow** Country: The Crow Indians' Own Stories by Joseph Medicine Crow (**Indian Author**), Orion, 1992.

CHECK YOUR LOCAL LIBRARIES FOR BOOKS AND OTHER MATERIALS ON LOCAL TRIBES.

BEFORE 1492

50,000 B.C. Archeologists believe that this is when people begin to cross the Bering Strait land bridge and dispersed throughout North and South America. But Indian people, in general, and others don't believe this theory. Indian people believe they have always been in the Americas, and nonIndians keep discovering evidence that may refute the Bering Strait theory. Indian people have their own creation stories.

1000 B.C. – 200 A.D.

Adena Mound Building culture in and near the Ohio Valley

300 B.C. – 700 A.D.

Hopewell Mound Building culture in the East

300 B.C. – 1000 A.D.

Mogollon culture in the Southwest

100 B.C. – 1500 A.D.

Hohokam culture in the Southwest

100B.C. – 1300 A.D.

Anasazi culture in the Southwest

700-1700 A.D.

Mississippian Mound Building culture in Southeast

985-1014 A.D.

Eric the Red and Leif Ericson establish settlements in Greenland and North America

LITERATURE FOR UNIT -

Archaeology of Native Americans, Indians of North America Series ed. by Frank W. Porter, Chelsea House.

The Earliest Americans by Helen Roney Sattler, Clarion, 1993.

Clash of Cultures: Prehistory-1638 by Christopher Collier, 1998.

Mounds of Earth and Shell: Native Sites, the Southeast by Bonnie Shemie, 1994.

The Earthshapers: Midwest Moundbuilders by Karen Speerstra.

Ancient Indians of the **Southwest** by Alfred Tamarin and Shirley Glubok, Doubleday.

The Ancient Cliff Dwellers of Mesa Verde by Caroline Arnold, Clarion, 1992.

Mesa Verde/National Park by Ruth Shaw Ladlauer.

Native Americans and Mesa Verde by Hazel Martell, 1993.

Canyon de Chelly: The Story of Its Ruins and People by Z.A. Bradley, National Park Service, 1973.

Cities in the Sand: The Ancient Civilizations of the Southwest by S. Warren, Chronicle Books, 1992.

The Anasazi by Eleanor Ayer, 1992.

Dog People by Joseph Bruchac (**Indian Author**).

A series of stories set in northern New England in ancient times. **Abenaki**

Journey to Center Place by Viola Gates, Council for Indian Education.

1492 AND THE 1500's

- 1492 Columbus – 5 million Indian people in North America, excluding Mexico.
- 1513 Juan Ponce de Leon of Spain sailed to Florida.
- 1528-1536 The Panfilo de Narvaez Expedition of Spain through the Southeast and Southwest
- 1532-1541 Frenchmen explore the Atlantic Coast and the St. Lawrence River system.
- 1539-1542 Spanish explore the Southwest, Southeast and Pacific Coast.
- 1560-1570 The Iroquois League consisting of the Mohawk, Oneida, Onondaga, Cayuga, and Seneca tribes formed by Deganawida and Hiawatha.
- 1562-1565 The French establish colonies in South Carolina and Florida but are driven out by the Spanish.
- 1565 The Spanish establish St. Augustine in Florida, the first permanent European settlement in North America.
- 1568 The Catholic Church starts the first missionary Indian school in Havana for Indian children brought from Florida.
- 1576-1579 Englishmen explore the Northwest and the California Coast.
- 1585-1590 Englishman Sir Walter Raleigh established two colonies on Roanoke Island, North Carolina. Both of them failed.
- 1586 A potato crop was taken to England.
- 1598 Spaniard Juan de Onate founded colony in New Mexico. Today it is San Juan Pueblo.
- 1598-1599 Indians of Acoma Pueblo in New Mexico attack Spanish. Juan de Onate and forces kill eight hundred Indians.

LITERATURE FOR UNIT -

Morning Girl by Michael Dorris (**Indian Author**), Hyperion.

About the lives of a 12 year old girl and her brother on a Bahamian island in 1492.

A Coyote Columbus Story by T. King (**Indian Author**), Groundwood, 1992.

Rethinking Columbus: Teaching about the 500th Anniversary of Columbus, by Rethinking Schools.

Columbus Day by Jimmie Durham (**Indian Author**), West End, 1983.

Columbus/His Enterprise by Hans Koning, Monthly Review, 1991.

Sees Behind Trees by Michael Dorris (**Indian Author**), Hyperion.

About a **nearsighted Powhatan** boy in fifteenth century America.

Children of the Longhouse by Joseph Bruchac (**Indian Author**), Dial.

A novel set in a **Mohawk** village of the late 1400's.

Clash of Cultures: Prehistory -1638 by Christopher Collier, 1998.

Hiawatha - Founder of the **Iroquois** Confederacy, North American Indians of Achievement Series.

Hiawatha: Messenger of Peace by D.B. Fradin, McElderry Books, 1992.

Hiawatha and the **Iroquois** League by M. McClard, Silver Burdett, 1989.

The Amazing Potato by Milton Meltzer.

Aztecs, Indians of North America Series ed. by Frank W. Porter, Chelsea House.

Pueblo, Indians of North America Series ed by Frank W. Porter, Chelsea House.

The **Pueblos**, Indians of the Americas Series.

Native Americans and the Spanish, Indians of North America Series ed. by Frank W. Porter, Chelsea House.

THE 1600's AND 1700's

- 1600 Sheep were brought to the Southwest by the Spanish.
- 1600-1770 The use of the horse by Indian people spread from Mexico into the Southwest and into the Great Plains.
- 1607 The English established their first permanent settlement at Jamestown, VA under John Smith.
- 1609-1613 John Smith captured by Indians. Story that Pocahontas, Powhatan's daughter, interceded on Smith's behalf. Pocahontas is captured by the settlers, marries John Rolfe, travels to England where she dies.
- 1615 Frenchman Samuel de Champlain attacks Onondaga villages with Huron war party and turns Iroquois League against the French.
- 1620 The Pilgrims arrive at Plymouth. Squanto had been kidnapped and taken to England earlier and teaches them how to plant corn.
- 1621 With Squanto acting as interpreter, the Pilgrims make a pact of peace with the Wampanoags and celebrate the first Thanksgiving.
- 1622 The Powhatan confederacy of 32 tribes under Opechancanough attacked Settlers at Jamestown.
- 1626 The Canarsee Indians sell Manhattan Island to Peter Minuit, governor of New Netherlands for sixty guilders worth of trade goods.
- 1627 The Company of New France is chartered to colonize and develop fur trade with the Indians.
- 1638 Pequot War in New England claims the lives of 600 Indian men, women and children.
- 1661 The Spanish raid the sacred kivas of the Pueblo people to destroy their culture and religion.
- 1675-1676 King Phillip, Wampanoag, wages war against the colonies and several other tribes that joined forces with the colonists.
- 1680 Pueblo Indians revolt against Spanish rule. Spanish return in 1689.
- 1689-1697 French and Indian War. The Iroquois sided with the English and Algonquin nations with the French.

- 1703-04 Queen Anne's War between England and France in the Northeast and England and Spain in the South.
- 1744-1748 King George's War between French and English divides the Indian tribes.
 - 1751 Benjamin Franklin sites Iroquois League as a model for his plan for government.
 - 1755 Iroquois League sides with the British against the French.
 - 1760 War between the colonists and the Cherokee
 - 1761 The Aleuts of Alaska revolt against the Russians.
- 1763-1764 Chief Pontiac rebels against the English in the Great Lakes region.
 - 1769 California is claimed for Spain and missions were established.
- 1775-1783 The American Revolution. Declaration of Independence signed in 1776.
 - 1778 The first U.S.- Indian treaty is signed between the U.S. and the Delaware.
 - 1778 The Iroquois, under Joseph Brant, and British regulars attack American Settlers in New York and Pennsylvania.
 - 1779 A counteroffensive against the Iroquois breaks the power of the League.
- 1781-1789 The Articles of Confederation include the principle that the central Government should regulate Indian affairs and trade.
 - 1784 The Congress orders the War Office to provide troops to assist the Commissioners in their negotiations with the Indians.
 - 1787 The Northwest Ordinance calls for Indian rights, the establishment of reservations and the sanctity of tribal lands.
 - 1789 Congress establishes a Department of War and grants the Secretary of War authority over Indian affairs.
- 1787-1789 The Constitution contains the power to regulate commerce with foreign nations, among the states, and with Indian tribes.
 - 1794 The Battle of Fallen Timbers takes place. Miami and Shawnee defeated.

LITERATURE FOR UNIT -

Clash of Cultures: Prehistory - 1638 by Christopher Collier, 1998.

Pocahontas - **Powhatan** Peacemaker, North American Indians of Achievement Series.

Squanto's Journey: The Story of the First Thanksgiving by Joseph Bruchac (**Indian Author**), Harcourt. **Wampanoag**

Guests by Michael Dorris (**Indian Author**), Hyperion.
Thanksgiving as it might have appeared to a Native American boy.

Thanksgiving: A Native Perspective by Doris Seale, Carolyn Silverman (**Indian Authors**) and Beverly Slapin, Oyate, 1996.

King Phillip - **Wampanoag** Rebel, North American Indians of Achievement Series.

King Phillip and the War with the Colonists by R. Cwiklik, Silver Burdett Press, 1989.

Pontiac - **Ottawa** Rebel, North American Indians of Achievement Series.

Joseph Brant - **Mohawk** Chief, North American Indians of Achievement Series.

The **Iroquois** by Virginia Driving Hawk Sneve (**Indian Author**), Holiday House.

Iroquois, Indians of North America Series ed. by Frank W. Porter, Chelsea House.

A Simple and Informative Guide to Understanding Treaties by Jan Hare (**Indian Author**)

A Mission for the People: The Story of Purisima by Mary Ann Fraser, Henry Holt, 1998.

A Time of Resistance: **California** Indians During the Mission Period, 1769-1848, by Sarah Supahan, Klamath-Trinity Joint Unified School District, 1992.

Digger: The Tragic Fate of the **California** Indians from the Missions to the Gold Rush by Jerry Stanley.

The Arrow over the Door by Joseph Bruchac (**Indian Author**). **Abenaki**
In 1777, a group of Quakers and a party of Indians have a memorable meeting.

From the Ashes by Pat Ramsey Beckman, Council for Indian Education. **Shawnee**

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Great Native Americans by Peter Copeland.

1800 TO 1868

- 1802 Congress appropriated funds to "civilize and educate" Indian people.
- 1803 The Louisiana Purchase adds a large Indian population to the U.S.
- 1803-1806 Lewis and Clark expeditions open up the West.
- 1809-1811 Tecumseh, a Shawnee chief, tries to unite tribes against the U.S.
- 1809-1821 Sequoyah creates the Cherokee alphabet. In 1830, the Cherokees started their own educational system using the alphabet.
- 1812-1815 The War of 1812 between the U.S. and England. Tecumseh is killed.
- 1813-1818 Andrew Jackson takes Creek lands, invades Florida to punish Seminoles.
- 1830 The Indian Removal Act calls for relocation of eastern Indians to Indian Territory west of the Mississippi River.
- 1831-1839 Five Civilized Tribes of the Southeast relocated to Indian Territory.
- 1832 The Bureau of Indian Affairs is organized as part of the War Department.
- 1845-1853 The Spanish Southwest and its many Indian tribes become part of U.S.
- 1848-1849 Gold discovered in California, destruction of California and Plains Indians.
- 1849 Bureau of Indian Affairs is transferred to the Dept. of Interior.
- 1851 The Treaty of Ft. Laramie between the U.S. and Northern Plains tribes.
- 1853-1856 U.S. acquires 174 million acres through 52 treaties, all broken by whites.
- 1858-1859 Gold is discovered in Colorado.
- 1864 The Navajo people are forced on the "Long Walk" to Bosque Redondo.
- 1864 Three hundred Cheyenne and Arapaho killed at Sand Creek Massacre.
- 1865 Government gives contracts with missionaries to start Indian schools.
- 1866-1868 War for the Bozeman Trail includes Sioux, Cheyenne and Arapaho under Red Cloud. Second Ft. Laramie Treaty.

LITERATURE FOR UNIT –

Sacagawea – Westward with Lewis & Clark, North American Indians of Achievement Series.

Sacajawea by Joseph Bruchac (**Indian Author**).

Osceola – **Seminole** Rebel, North American Indians of Achievement Series.

Osceola: Patriot and Warrior by M. Jumper, Raintree Steck Vaughn, 1993.

John Hawk, A **Seminole** Saga by Beatrice Levin, Council for Indian Education.
John White becomes involved with Osceola in the fight to save their land in the early 1800's.

Tecumseh – **Shawnee** Rebel, North American Indians of Achievement Series.

Sequoyah – Inventor of the **Cherokee** Alphabet, North American Indians of Achievement Series.

Sequoyah's Gift: A Portrait of the **Cherokee** Leader by J. Klausner, Harper Collins, 1993.

In the time of Wolves by Eileen Charbonneau (**Indian Author**), Tom Doherty, 1994.
Cherokee

The Ghosts of Stony Clove by Eileen Charbonneau (**Indian Author**), Tom Doherty, 1988.

Sparrow Hawk by Meridel LeSeuer, Holy Cow!, 1987. **Mesquakie**

Longwalker's Journey: A Novel of the **Choctaw** Trail of Tears by Beatrice Orcutt Harrell (**Indian Author**), Dial, 1999.

Rising Fawn and the Fire Mystery by Marilou Awiakta (**Indian Author**), Iris, 1983. The story of a young **Choctaw** girl during the Trail of Tears.

The Trail of Tears by Joseph Bruchac (**Indian Author**), Random House. **Cherokee**

Night of the Cruel Moon, **Cherokee** Removal and the Trail of Tears by Stan Hoig.

Birchbark House by Louise Erdrich (**Indian Author**), Hyperion.
The story of a young **Ojibwa** girl in 1847.

Horse Raid: An **Arapaho** Camp in the 1800's by Susan Korman, Smithsonian Institution, 1998.

The Glorious Quest of Chief Washakie by Ralph and Mary Tillman. **Shoshone**

Navajo Long Walk by N.M. Armstrong, Roberts Rhinehart Pub., 1994.

Daily Life in a Plains Indian Village, 1868 by Michael Bad Hand Terry, 1999.
Cheyenne

Red Cloud - **Sioux** War Chief, North American Indians of Achievement Series.

Red Cloud by Ed McGaa (**Indian Author**), Dillon, 1977. **Lakota**

When Buffalo Ran by George Bird Grinnell.

Through **Dakota** Eyes: Native Accounts of the Minnesota Indian War of 1862 by Gary C. Anderson and Alan R. Woolworth, Minnesota Historical Press.

Red Wing and Shakopee in They Led a Nation by Virginia Driving Hawk Sneve (**Indian Author**), Brevet Press, 1975. **Dakota**

Cochise - **Apache** Chief, North American Indians of Achievement Series.

Son of Thunder by Stig Holnas, Roberts Rinehart, 1993. **Apache**

Waterlily by Ella Deloria. **Dakota**

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Native American Leaders by Janet Hubbard-Brown.

Great Native Americans by Peter Copeland.

Indian Heroes and Great Chieftains by Charles Eastman (**Indian Author**).

Battlefields and Burial Grounds by Roger C. and Walter Echo-Hawk (**Indian Authors**), Lerner, 1994.

1869 TO 1899

- 1868-1869 Southern Plains War involves Cheyennes, Sioux, Arapahos, Kiowas and Comanches.

- 1869 President Grant's Peace Policy instituted. Lasts until 1871.

- 1869 Ely Parker (Seneca) becomes first Indian Commissioner of Indian Affairs.

- 1869 Transcontinental railroad is completed, joined at Promontory Point, UT.

- 1871 Congress passes law forbidding further treaties with Indian tribes.

- 1871 Western Indians not to leave reservations without permission of agents.

- 1871 White hunters begin wholesale killing of buffalo.

- 1874 Gold discovered in the Black Hills of South Dakota. Miners ignore treaties.

- 1876-1877 Sioux War for the Black Hills under Sitting Bull and Crazy Horse.

- 1876 Battle of the Little Bighorn. Custer defeated.

- 1877 Nez Perce under Chief Joseph take flight.

- 1878 Congress provides for Indian police.

- 1879 Richard Pratt starts Carlisle Indian School in Pennsylvania to assimilate Indians. Start of government boarding schools.

- 1881 Sitting Bull and his band surrender at Ft. Buford, North Dakota.

- 1881-1886 Apache resistance under Geronimo in the Southwest.

- 1885 The last great herd of buffalo is exterminated.

- 1887 Congress passed the Allotment Act (Dawes Act) and gave individual Indians parcels of land and opened up surplus to whites.

- 1890 The Ghost Dance Movement led by Wovoka (Paiute) gains influence. The Wounded Knee massacre in South Dakota.

- 1890-1910 The population of Indians fell to a low point of less than 250,000 in U.S.

LITERATURE FOR UNIT –

Quannah Parker: **Comanche** Warrior by W. R. Sanford, Enslow Pub., 1994.

Quannah Parker – **Comanche** Chief, North American Indians of Achievement Series.

Riel's Saskatchewan Rebellion by F. W. Anderson, 1987.

Louis Riel by R. Neering, Fitzhenry & Whiteside, 1992.

War of the Mormon Cow: Crazy Horse Chronicles by Richard Jepperson.

They Led a Nation by Virginia Driving Hawk Sneve (**Indian Author**), Brevet, 1975.
Biographies of 20 **Sioux** leaders.

Chief Gall – **Sioux** War Chief, North American Indians of Achievement Series.

Sitting Bull – **Sioux** Leader, North American Indians of Achievement Series.

Sitting Bull by Herman Viola, American Indian Stories Series, Raintree.

Crazy Horse – **Sioux** War Chief, North American Indians of Achievement Series.

The Life and Death of Crazy Horse by R. Freedman, Holiday House, 1996.

Keeper of Fire, Council for Indian Education.

A young survivor of the Custer Battle faces great danger and hardship.

Chief Joseph – **Nez Perce** Leader, North American Indians of Achievement Series.

Chief Joseph: **Nez Perce** Warrior by W. R. Sanford, Enslow Pub., 1994.

Indian School: Teaching the White Man's Way by Michael Cooper, Houghton Mifflin, 1999.

The Middle Five: Indian School Boys of the **Omaha** by Francis LaFlesche (**Indian Author**).

The Ledgerbook of Thomas Blue Eagle by Gay Matthaei and Jewel Grutman.

Julia Singing Bear by Gay Matthaei and Jewel Grutman.

Flight of the Red Bird, The Life of Zitkala-Sa recreated by Doreen Rappaport.

Geronimo and the Struggle for **Apache** Freedom by Russell Shorto, Alvin Josephy's Biography Series of American Indians, 1990.

Geronimo – **Apache** Warrior, North American Indians of Achievement Series.

Geronimo by David Jeffery, American Indian Stories Series, Raintree.

Spirit of the White Bison by Beatrice Culleton (Indian Author), Book Pub. Co., 1985.

Sarah Winnemucca – Northern **Paiute** Writer and Diplomat, North American Indians of Achievement Series.

Sara Winnemucca by Mary Francis Morrow, American Indian Stories Series, Raintree.

Susette LaFlesche by Marion Marsh Brown. **Omaha**
She worked extensively for the Indian cause.

Wounded Knee, Adapted for Young Readers by Amy Erlich. **Lakota**

A Boy Becomes a Man at Wounded Knee by Ted Wood with Wambli Numpa Afraid of Hawk (**Indian Author**), Walker & Co., 1992. **Lakota**

Goodbird, the Indian by Edward Goodbird (**Indian Author**). **Hidatsa**

Old Indian Days by Charles Eastman (**Indian Author**). **Dakota**

Indian Boyhood by Charles Eastman (**Indian Author**). **Dakota**

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Native American Leaders by Janet Hubbard-Brown.

Great Native Americans by Peter Copeland.

Children of the Circle: A Photographic History of Native American Children from 1880 to 1920 by Adolph and Star Hungry Wolf (**Indian Authors**).

Battlefields and Burial Grounds by Roger C. and Walter R. Echo-Hawk (**Indian Authors**), Lerner, 1994.

Indian Heroes and Great Chieftains by Charles Eastman (**Indian Author**).

My People: the **Sioux** by Luther Standing Bear (**Indian Author**), Univ. of Neb. Press.

My Indian Boyhood by Luther Standing Bear, University of Nebraska Press. **Lakota**

1900 TO 1952

- 1902 The Reclamation Act encourages settlement of the West.
- 1906 The federal government seized 50,000 acres of wilderness land including the sacred Blue Lake of the Taos Pueblo.
- 1909 Teddy Roosevelt issues executive order transferring 2.5 million acres of Indian timber lands to national forests.
- 1910 U.S. government forbids the Sun Dance among Plains Indians.
- 1911 The Society of American Indians was formed as an activist group.
- 1914-1918 Many Indian people enlisted in the armed forces during WWI.
- 1917-1920 Many Indians lost their lands to corrupt Anglos.
- 1921 The Dept. of Interior responsible for Indian education and social services.
- 1924 Congress awarded American citizenship to all Indians. Some had already obtained it.
- 1928 Charles Curtis, Kaw Indian and U.S. Senator, was elected vice-president under Hoover.
- 1928 The Merriam Report deplored Indian living conditions and declared the allotment system a failure.
- 1934 The Wheeler-Howard Act provides for tribal ownership of land and tribal self-government.
- 1941-1945 Twenty-five thousand Indians served in active duty during WWII. The code talkers used their language as a code the enemy couldn't decipher.
- 1944 The National Congress of American Indians was organized.
- 1946 An Indian Claims Commission was created to settle tribal land claims against the U.S.
- 1949 The Hoover Commission recommended termination of the federal-Indian trust relationship.
- 1952 BIA program for voluntary relocation of Indians to urban areas for work.

LITERATURE FOR UNIT –

Ishi, Last of His Tribe by Theodora Kroeber. **California**

Ishi by Louise V. Jeffredo-Warden, American Indian Stories Series, Raintree.

Native Americans and the Reservation by Anita Louise McCormick.

Carlos Montezuma by Peter Iverson, American Indian Stories Series, Raintree. **Yavapai**

Flight of the Red Bird: The Life of Zitkala-Sa by Doreen Rappaport.

Story of **Yankton Sioux**, Gertrude Bonnin, who fought for justice for Indian people.

Native American Doctor by Jeri Ferris. Story of Susan LaFlesche, **Omaha**.

Charles Eastman – **Sioux** Physician and Writer, North American Indians of Achievement Series.

Charles Eastman: Physician, Reformer, and Native American Leader by Peter Anderson.

“Mush-hole”: Memories of a Residential School by Maddie Harper (**Indian Author**), Sister Vision, 1993. **Ojibwa**

Kaibah: Recollections of a Navajo Girlhood by Kay Bennett (**Indian Author**), Westernlore, 1964.

Children of the Circle: A Photographic History of Native American Children from 1880 to 1920 by Adolf and Star Hungry Wolf (**Indian Authors**).

Braid of Lives: Native American Childhood by Neil Philip.

Plenty Coups by Michael Doss (**Indian Author**), American Indian Stories Series, Raintree. **Crow**

The Code Talkers: American Indians in W.W. II by Robert Daily.

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

An Album of the ~~American~~ Indian by Rosebud Yellow Robe (**Indian Author**), Watts, 1970.

Great Native Americans by Peter Copeland.

American Indian Contributors to American Life by John M. Franco and others, Benefic Press, 1975.

1953 TO 2000

- 1953-1956 The Termination Resolution. Sixty-one groups were terminated.
- 1953 Congress empowered certain states to have law and order jurisdiction of Indian reservations without the consent of the tribes.
- 1961 Tribes allowed first opportunity to purchase individual Indian lands.
- 1961 Keeler Commission on Rights, Liberties and Responsibilities of the American Indian recommended self-determination/resource development
- 1964 The Office of Economic Opportunity was created and provided anti-poverty programs on reservations.
- 1964-1968 The Civil Rights Act led to the decree that states cannot assume law and order jurisdiction on reservations without the consent of tribes..
- 1968 American Indian Movement founded.
- 1968 President Johnson calls for self-determination to replace termination.
- 1969-1971 Indians occupied Alcatraz Island in San Francisco Bay.
- 1970 A federal policy of Indian self-determination was formulated.
- 1970 Blue Lake Wilderness Area in New Mexico returned to Taos Pueblo.
- 1972 AIM occupies and destroys BIA offices in Washington, DC.
- 1973 AIM and Oglala Sioux occupied Wounded Knee for 71 days.
- 1974 Federal Acts provided housing and loans to Indians for businesses.
- 1978 Indian activists organized the "Longest Walk" to Washington, DC.
- 1978 The American Indian Freedom of Religion Act passed.
- 1988 The Indian Gaming Act was passed.
- 1992 Indian people throughout the Americas protested the celebration of the Columbian Quincentennial.
- 2000 Indian population in U.S. 4 Million-U.S. Census

LITERATURE FOR UNIT –

Dennis Banks – Native American Activist available from Four Winds Books, York, NE.
Ojibwa

Ben Nighthorse Campbell – **Cheyenne** Chief, U.S. Senator, North American Indians of Achievement Series.

Peter Macdonald – Former Chairman of the **Navajo** Nation, North American Indians of Achievement Series.

Wilma Mankiller – Principal Chief of the **Cherokee**, North American Indians of Achievement Series.

Wilma Mankiller by Jacki Thompson Rand, American Indian Stories Series, Raintree.

Great Native Americans by Peter Copeland.

The Encyclopedia of Native American Biography by Bruce Johansen and Donald Grinde.

Happily May I Walk: American Indians and Alaska Natives Today by Arlene Hirschfelder (**Indian Author**), Scribner's Sons, 1986.

Shooting Back from the Reservation: A Photographic View of Life by Native American Youth by Jim Hubbard, New Press, 1994.

An Album of the American Indian by Rosebud Yellow Robe (**Indian Author**), Watts, 1970. An overview of history up to 1970.

Native America in the 20th Century by Mary B. Davis.

Native Americans and the Reservation by Anita Louise McCormick.

Alcatraz: Indian Land Forever and You Are on Indian Land! By Troy Johnson, UCLA, 1994 and 1995.

American Indian Facts of Life by George Russell (**Indian Author**) available from Four Winds Books, York NE. Indianology 101

American Indian Contributors to American Life by John M. Franco and others, Benefic. .

Rights of American Indians and Their Tribes by Stephen L. Pevar.

Modern Indian Issues by Priscilla Buffalohead, Anoka-Hennepin Indian Education Program, Minnesota.

U. S. HISTORY STANDARDS ADDRESSED -

Standard -Understands the status and complexity of pre-Columbian societies of the Americas

Benchmarks -

Understands the culture and agricultural practices of Native American societies along the eastern seaboard and in the Southwest where the first North American interactions occurred with the English and Spanish explorers

Standard -Understands the long-term consequences of the meeting of three worlds from the beginnings to 1607

Benchmarks -

Understands the redistribution of the world's population and the catastrophic losses of indigenous populations of the Americas, largely to diseases

Standard -Understands how the European colonies in North America were peopled in the colonial period (1585-1763) and how the colonists interacted with Native Americans and with one another

Benchmarks -

Understands how relations between colonists and Native Americans varied between that characterized by William Penn's peaceful relations with the Delaware chiefs to such extents as the Pequot massacre in 1637

Understands how European wars drew the English colonists along with their Indian allies into conflict with the Indian allies of Spain and France

Standard - Understands how the values and institutions of European economic life took root in the colonies

Benchmarks -

Understands the natural setting that Europeans found and the manner in which they began to shape and exploit the American land (e.g., alteration of the continent's plant and animal life, the concept of land as a commodity)

Standard -Understands the causes and character of the American Revolution, the ideas and interests involved in forging the revolutionary movement, and the reasons for the American victory

Benchmarks -

Understands the major stages of the Revolutionary War and the reasons for the American victory including the role of American Indian leaders

Standard -Understands how the American Revolution changed or maintained social and economic relationships among the nation's many groups and regions, and how these relationships changed from 1754-1815

Benchmarks -

Understands the revolutionary goals of different social groups including Native Americans and the Revolution's transformation of social, political, and economic relationships among them

Standard -Understands how American external relations changed during the Revolution and in the era of the early republic (1754-1815)

Benchmarks -

Understands the relations between the new American nation and Native Americans after the Revolution (e.g., the series of military campaigns and treaties that transferred Indian title of much of the Old Northwest territory to the new nation)

Standard -Understands U.S. territorial expansion between 1800 and 1861, and how this involved changing relations with external powers and Native Americans

Benchmarks -

Understands the frontier as a zone of cultural interaction between Native Americans already in the region and new arrivals moving westward from the eastern U.S., northward from Mexico, and eastward from Asia

Understands 19th century federal policy toward Native Americans, including the crisis of 1829 following Jackson's election, and removal of the six southern nations to the western territories

Standard -Understands how massive immigration and internal migration after 1870 led to new social patterns, conflicts, and ideas of national unity amidst growing cultural diversity between 1870 and 1900

Benchmarks -

Understands how the Homestead Act of 1862 fueled the expansion of migration on the Great Plains and the Second Great Removal of Native Americans

Standard -Understands the foundations established during the 1920's for the nation's political economy and culture

Benchmarks -

Understands that large parts of the U.S. population, including Native Americans, were left outside the era of opportunity and advancement

Standard -Understands social changes in American society brought about by the Civil Rights movements

Benchmarks -

Understands the parallel civil rights movements of Hispanic and Native Americans (e.g., the rise of the United Farm Workers, Native American struggles for restoration of land and water rights)

- McRel Compendium of Standards, 1994.

AMERICAN INDIAN STANDARDS FOR HISTORY ADDRESSED –

The student understands the patterns of change in indigenous societies in the Americas up to the Columbus voyages.

The student is able to draw upon data provided by archaeologists and geologists to explain the origins and migration from Asia to the Americas and contrast them with Native Americans own beliefs concerning their origins in the Americas.

Indian students should understand that Native Americans believe that their origins are in the Americas and that these beliefs are exemplified by the many and varied creation/origin stories of different tribes. Students should also note that these beliefs conflict with the anthropological theory known as the Bering Strait theory. Students should be able to note problems with the Bering Strait theory, such as the matter of when Indians would have had to arrive in the Americas – specifically, either 40,000 or 12,000 years ago, which are the periods of the last two Ice Ages in which the land bridge opened up across the strait. Some scientists have found evidence of Native American people living here tens of thousands of years earlier. At the very least, students should understand that humans were in the Americas at the time that humans and Neanderthal man were living in Europe.

The student is able to trace the spread of human societies and the rise of diverse cultures from hunter-gatherers to urban dwellers in the Americas.

It should be noted that many American Indian people feel that the term “rise” is biased and unfair when used to describe changes in or evolutions of cultures. It forces a qualitative assessment of the histories of diverse Indian civilizations, and invites comparisons among them.

Indian students should understand that thousands of years before the Columbian voyages, Native American societies existed across a wide spectrum of cultural patterns, including small to large groups of hunter-gatherers, as well as small to large agricultural communities. Students should know that cultures were influenced by geographic and environmental resources. Native American communities were not static, but changed as they adapted to new resources and technologies. Some of these new technologies were corn agriculture, ceramic pottery-making and stone/metal tool-making. Students should be able to reconstruct the historical patterns of succession and movement of these technologies.

Indian students should be able to explain that although certain Native American cultures may have been small hunter gatherer bands, their cultures were quite complex in terms of their languages, philosophies of ecological relationships, astronomical knowledge, and knowledge of plants/medicines. Students should be able to trace the trade networks that stretched across America for thousands of miles. For example, turquoise from the

Southwest was graded for shells and parrot feathers from the Yucatan Peninsula in Mexico. Great Lakes copper was traded for corn, conch shell and other goods from the lower Mississippi River and Gulf area. Obsidian from the Rockies and pipestone from Minnesota were traded as far east as present-day Ohio.

The student is able to explore the rise and decline of the Mississippian mound-building society.

Indian students should understand that by 750 AD an agricultural society of Native Americans flourished along the Mississippi River valley and its tributaries. This culture is now known as the Mississippian Mound-builder culture, so named for the earthen mounds they built and on which they constructed large ceremonial temples and rulers' residences. The culture reached its zenith in about 1200 AD – the large city known as Cahokia had a population of about 50,000. Located along the banks of the Mississippi near present-day St. Louis, Cahokia was dominated by a huge earthen mound standing over 100 feet in height, with a base 1,000 feet long and 700 feet wide. The people of the Mississippian culture had a highly developed ceremonial structure, and they farmed a wide variety of plants – amaranth, squash, maize, goose foot, sunflowers. They also used copper in making blades and ornaments. The culture eventually died out, probably due to epidemics of diseases brought by Europeans. Students should understand that the barrage of diseases introduced into the Americas was not necessarily the result of face-to-face encounters between Europeans and Indians. It is more probable that waves of disease, carried by infected Indian traders and refugees from infected villages, resulted in the spread of epidemics from Indian community to community. Students should be able to analyze the multiple causes which brought about the decline of the Mississippi Mound-building society. Students should also be familiar with other large, complex, agricultural societies that existed in pre-Columbian America.

The student understands the differences and similarities among Africans, Europeans, and Native Americans who converged in the western hemisphere after 1492.

The student is able to compare political systems, including concepts of political authority, civic values, and the organization and practice of government.

Indian students should understand that while most European and African societies were ruled by monarchies, most Native American societies were egalitarian in nature. Although not all Native governing systems were egalitarian, leaderships within most Indian groups was a shared responsibility. In very few places in the Americas could a single leader speak for an entire tribe and expect his decisions to be followed. Rather, the more typical form of Native American government embodied concepts such as decision by consensus, representative government, clan structures represented in government, separation of powers, and limited systems of checks and balances. Students should be able to compare and contrast these traditional political systems with their contemporary counterparts elsewhere in the world, as well as with today's U.S. system.

The student is able to compare social organizations, including population levels, urbanization, family structure, and modes of communication.

Indian students should know that scientists now estimate that there were at least 4.5 million people in North America – excluding Mexico – and possibly as many as 10 million, prior to European arrival. For the Western Hemisphere as a whole, there were probably over 57 million people – and possibly as many as 90 million – in contrast with 60 to 70 million people in Europe at that time. Students should understand that European societies lacked waste disposal, had higher densities of people and were affected by widespread plagues for centuries. This is a great contrast to the standard of living in most Native American societies in North America at that time (excluding Mexico) where, for the most part, people lived in small towns (of about 2,000 people) and smaller farming villages. These small towns and villages were much healthier places in which to live than their European counterparts due to the fact that fewer people living in a larger space have much less of an impact on the environment. Students should also understand that in Europe famines were rampant, as opposed to in the Americas where Native peoples enjoyed an abundance of natural resources, as well as cultivated foodstuffs, that were the result of healthy ecological practices. Additionally, in Europe most natural resources (e.g. wood) and most land was held by an aristocracy; therefore the majority of the people were peasants and serfs. These are only a few of the contrasts in social organization.

Indian students should, however, also be able to compare the small village life of most Native Americans with the several large urban centers in the Americas which rivaled 15th century European cities in population size; for example, Cahokia (where St. Louis is today) was about the size of Rome (population 55,000); Tenochtitlan in Mexico was about the size of London (population 75,000). Before that time, there were other large cities in Mexico – such as Teotihuacan, which at its peak in 400-600 A.D. had around 200,000 inhabitants. These cities were important centers of large complex societies. Such societies flourished across the Americas during different periods. Indian students should learn about the cultural and scientific achievements of the Mississippian people, the Hopewell, the Adena, the Mayans, the Aztecs, the Anasazi, and the Hohokam. Students should also understand that American Indian societies were built upon large extended family networks that were organized into other social units, e.g., clans, matriarchal/patriarchal systems, and moiety systems.

The student is able to compare economic systems, including systems of labor, trade, concepts of property, and exploitation of natural resources.

Indian students should understand that European and American Indian economic systems were based on fundamentally conflicting views of how land and natural resources should be exploited. Following biblical injunction, European economic systems were based on "dominion over nature." American Indian economic systems, on the other hand, were based upon building an awareness of ecological relationships and managing natural resources without depleting them. Students should be aware that the European world

view feared the natural world (including man's nature) and viewed it as something to be subdued. Thus, forest with their wild animals were cleared for farmlands and quickly over-harvested to near depletion. For example, by 1086, England was only 20% forested – of that, only 2% was virgin forest. There were enormous alterations in the European landscape by the 15th century. European attitudes toward animals were markedly different from those of American Indians. For example, Europeans pursued activities such as sport hunting, bear baiting, cockfights and bullfights – some of which are considered barbaric today. In contrast, hunting practices among most if not all American Indian societies involved respect for the life of the animal being hunted.

The student is able to compare dominant ideas and values including religious belief and practice, gender roles, and attitudes toward nature.

Indian students should understand that most if not all American Indian societies viewed natural resources – including wildlife – as sacred. Native American world views stressed the interconnectedness of all living things. This belief shaped the purpose and scope of natural resource usage and was in sharp contrast with the beliefs of European settlers.

The student understands the stages of European oceanic and overland exploration, amid international rivalries, from the 9th to 17th centuries.

The student is able to evaluate the significance of Columbus' voyages and his interactions with indigenous peoples.

Indian students should understand that Columbus never actually set foot upon, or even saw, North America, let alone “discover” America (i.e., the land area encompassed by the United States). He also did not discover a “New World,” but unintentionally came upon a very old land which was well established with sophisticated societies. Students should understand that the Native peoples with which Columbus actually interacted – primarily The Arawaks, Taino, Carib and other tribal groups in the West Indies – were essentially decimated from a population of about a quarter-million to a population of under 20,000 within a span of 20 years. Students should understand that this decimation was not only the result of new diseases, but also the result of systematic and harsh enslavement of Native people.

The student is able to evaluate the course and consequences of the Columbian Exchange.

Indian students should understand that the “Columbian Exchange” had devastating effects on American Indian nations. Both exposure to new diseases, as well as more effective European weapons resulted in the deaths of millions of Indians. Death rates of up to 90% were common among American Indian tribes/nations. Students should also understand that many of today's foods common to Europeans and Americans were originally domesticated, cultivated, or farmed by Native Americans and introduced to Europeans – among these are turkeys, potatoes, corn, chili peppers, tomatoes, pumpkins

and squash, avocados, peanuts, pineapple, chocolate, vanilla. Many native objects – such as pottery, basketry, canoes, furs, snowshoes, etc. – were also adopted by early European settlers. Among the European items that were introduced to the Americas were citrus fruits, apples, bananas, peaches, pears, wheat, cabbage, and domesticated animals (cows, sheep, chickens, hogs, horses). American Indian groups quickly adopted items like guns, textiles and metal cookware.

The student understands the Spanish and Portuguese conquest of the Americas.

The student is able to explain and evaluate the Spanish interactions with such people as Aztecs, Incas, and Pueblos.

Indian students should understand that Spanish conquest of the Aztecs and Incas contributed to the eventual decimation of those societies and the destruction of their empires. The Spanish also attempted conquest of the Pueblo Indians of the Southwest, but the Pueblos successfully rebelled in 1680, forcing the Spanish out of what is now New Mexico; however, within 12 years the Spanish resettled in Pueblo country. However, the Pueblos were given land grants by the Spanish crown which were later recognized by the U.S. government under the terms of the Treaty of Guadalupe Hidalgo.

The student understands the European struggle for control of North America.

The student is able to analyze relationships between Native Americans and Spanish, English, French, and Dutch settlers.

Indian students should understand that there were some differences in the relationships between Native Americans and Spanish, French, English and Dutch settlers in the 17th and 18th centuries. Spanish interaction with Native Americans can generally be characterized as subjugation by conquest, forced labor, and forced religious conversion. Early French interactions can generally be characterized as more benign: for example, French traders married Indian women, and often lived in Indian communities. However, later French interactions changed to be more similar to those of the Spanish – in other words, they were centered on the religious conversion of Natives, as well as the exploitation of Native American communities and resources. English interactions with Native Americans were generally based on exploitation of Native American lands and resources. Since Indians were seen as “uncivilized,” English religious sects saw little value in saving “heathens,” and thus had few qualms about dispensing with them in exchange for property. Later, French and English interactions with various Native groups were based on competing military alliances established to protect their respective colonial and economic interests. Early Dutch interactions were primarily based on the desire to control the fur trade with Native Americans. As English and French alliances with Native groups grew, the Dutch influence was marginalized.

Indian students should understand the roles and actions of key American Indian leaders in forming and responding to tribal relationships with European colonists.

The student is able to compare how English settlers interacted with Native Americans in New England, mid-Atlantic, Chesapeake, and lower South colonies.

Indian students should understand that interactions between English settlers and Native Americans differed in New England, the mid-Atlantic and Chesapeake areas, and lower South colonies. In New England, Native American communities had become small as a result of exposure to European diseases as well as attacks on their villages. Their small numbers rendered them relatively defenseless against English incursions into their territories. In the mid-Atlantic and Chesapeake areas, on the other hand, the early English presence itself was smaller, and thus more precarious. Thus, early relations with Indians were initially relatively amicable. Discontent among the Indians grew, however, as the English presence became more invasive. This discontent resulted in an attack in 1622 by Powhatan warriors on the English in Jamestown. The English then retaliated with such force that they essentially eliminated the Powhatan Confederacy from being any further threat. In the southern colonies, the smaller coastal Indian tribes had been decimated by disease and English attacks. However, because the English were not as strong a presence as they were in New England, large tribal confederacies were able to sustain large communities further inland and away from colonial English settlements.

Students should also understand that the nature of relationships between American Indian tribes and European groups varied. While many relationships were adversarial, other relationships were more peaceful and mutually respectful. For example, in his dealings with the Lenape people of Pennsylvania, William Penn attempted to respect the tribe's rights of land ownership and governing its own people. Unfortunately, after his death, some of Penn's followers adopted an adversarial approach in dealing with the tribe.

The student is able to analyze how various Native American societies changed as a result of the expanding European settlements and how they influenced European societies.

Indian students should understand that Native American societies and cultures were forever changed as a result of devastating disease, genocide and displacement by European settlements. European expansion and economic activities not only created their own conflict with Native Americans, but also created conflict between Native American groups themselves. Students should learn that European societies were able to sustain larger populations and broaden commerce because of their usurpation and exportation of North American resources – such as foodstuffs and furs.

The student understands the factors affecting the course of the Revolutionary War and contributing to the American victory.

The student is able to compare and explain the different roles and perspectives in the war of men and women, including white settlers, free and enslaved African Americans, and Native Americans.

Indian students should understand that, in the early years of the Revolution, both the British and the revolutionaries tried to maintain friendships with Indians living on the edges of colonial settlements. Indian tribes, however, realized that the revolutionaries represented the ever-growing number of farmers who were destroying the Indian way of life. Thus, siding with the British gave Indians a chance to continue fighting the encroaching frontiersmen. For this reason, warriors, in cooperation with the British, made extensive attacks along the frontier borders – particularly in Kentucky, western Pennsylvania and New York. At the same time, American patriots were destroying Indian villages in western New York and in what was to later become Ohio and Tennessee. Students should also understand that, despite the fact Ohio and Tennessee. Students should also understand that, despite the fact that the Continental Congress established Indian commissions – in the north, south and middle states – and agents to deal with Indians, the states still conducted their own relations with Indian tribes.

Indian students should know that because of their strategic location along the Hudson River, the pro-British Iroquois played an especially significant role during the Revolutionary War. Since they formed a wedge between New England and the mid-Atlantic colonies, the Iroquois were able to assist British troops attacking from Canada. In turn, the colonists tried to court other Indian allies, such as the Delaware and Cherokees. As an incentive for their alliance, the colonists promised Indians their own states or representatives in the new government to be formed. These overtures were, however, usually rejected by the tribes. Additionally, students should understand that it is also unlikely that the new government would have followed through with those promises even if tribes had agreed to the plans. Once the Americans won, whether Indian groups had been their allies or foes, they received much the same treatment. Many eastern tribes lost their freedom and their lands, and were slowly displaced or sought refuge with tribes further west. In general, tribal groups were interspersed and many lost their Native languages, and their cultural distinctiveness changed as they were forced to mix with other tribes.

Indian students should understand the roles played by key American Indian leaders – such as Old Briton (Miami), Pontiac (Ottawa), Joseph Brant (Mohawk), Tecumseh (Shawnee), Pushmataha (Choctaw), Alexander McGillivray (Creek), and Black Hawk (Sauk) – in affecting important events during the American Revolution and subsequent new nation eras.

The student is able to analyze the terms of the Treaty of Paris and how they affected U.S. relations with Native Americans and with European powers that held territories in North America.

Indian students should be aware that prior to the Revolutionary War, Great Britain had guaranteed protection – as well as territory – to some of its Indian allies; in fact, the Proclamation of 1763 prohibited European settlement beyond the crest of the Appalachian Mountains. However, the British made no reference to any Native land rights when they signed the Treaty of Paris in 1783, in which they surrendered claim to

all land east of the Mississippi. When this happened, both the Indians and the British agents representing the crown were shocked at the lack of consideration of Indian rights. The American negotiators, however, felt Indians no longer had rights to any lands. This action was particularly ironic for those tribes who allied with the colonists. The Oneidas – the only Iroquois group allied with the Americans – saw their land base in New York decrease from five million acres, to little more than a thousand even though they had negotiated more than 30 treaties between 1785 and 1842. Students should understand that the Treaty of Paris' ultimate legacy for tribes was continued warfare, particularly for tribes further to the west as the U.S. expanded.

The student understands the Revolution's effects on different social groups.

The Indian student is able to compare the reasons why many white men and women and most African Americans and Native Americans remained loyal to the British.

Indian students should understand that there were many factors affecting Native American loyalties to the British. For example, many tribes had long-established trade relations with the British. These tribes were convinced that the British had greater military strength and, therefore, that tribes had the most to gain for their communities by helping the British win the war. These perspectives and concerns for their people's welfare served as the basis for tribal choices in alliance.

The student understands the international background and consequences of the Louisiana Purchase, the War of 1812, and the Monroe Doctrine.

The student is able to assess why many Native Americans supported the British in the War of 1812 and the consequences of this policy.

Indian students should understand that for American Indian tribes, the War of 1812 was seen as their last hope in the face of Manifest Destiny. Tribes supported the British in hopes of containing the young United States. Students should also be aware of the roles played by Tecumseh and his brother Tenskwatawa (the Prophet) who tried to unite Indian tribes in the Midwest against the Americans. Students should be aware of the major impact these two Shawnee leaders had against the Americans and that the British failed to match the tenacity of their Indian allies. It was this tenacious spirit of the Indians that the Americans, after the war, tried very hard to break. When the War of 1812 ended with the 1814 Treaty of Ghent, the real losses were most felt by the Indians. Ironically, while the U.S. still maintained relations with the British after the war, they sought to devastate Indian country.

The student understands federal and state Indian policy and the strategies for survival forged by Native Americans.

The student is able to compare the policies toward Native Americans pursued by presidential administrations through the Jacksonian era.

Indian students should understand that from the time of Washington's administration and up to the late 1820s, the dominant U.S. policy toward Indians was one that attempted to purchase Indian land as cheaply as possible and avoid further war with Indian tribes. It was felt that this policy would benefit both Indians and frontiersmen. Interest in pursuing a "moral" Indian policy largely stemmed from two factors: (1) the early American leaders' grounding in 18th century philosophy regarding the natural rights of man and (2) early American leader's desire that the new nation be an example to the world – beliefs particularly espoused by Thomas Jefferson. Of note, of course, is that this policy of peace and purchase was cheaper for the young nation than an Indian policy of war and conquest would have been. Students should also understand that this "moral" policy established very important precedents for dealing with Indian nations as equals, i.e., negotiating treaties with them for successions of land. These precedents have been key in Indian/Federal relations up to today. Indian students should also be familiar with the Trade and Intercourse Acts of 1790s and their implications for subsequent years.

Indian students should understand that the American plans to "civilize" Indians were based on feelings that the American way of life was the "highest" achieved since classical times. Thus, assimilating Indians into the American way of life was considered the height of generosity. Students should understand that this attitude prevailed until the 1840s and 1850s. At that juncture, the common attitude about Indians changed to the view that Indians were incapable of fitting into American society. Students should also understand that Indian tribes strongly resisted efforts to "Americanize" them. By Monroe's administration in the 1820s, the federal policy had changed to one of trying to exchange Indian lands in the East for lands West of the Mississippi. This policy was made possible by the Louisiana Purchase. By the time of the Jackson administration in the 1830s, the federal policy of Indian Removal – i.e., forced move to the west – was underway. Students should be particularly aware of the constitutional crisis caused when Jackson defied Chief Justice John Marshall's Supreme Court ruling which favored Cherokee claims over the state of Georgia's attempts to enact state jurisdiction over Cherokee lands. Jackson's desired policy ideas had run head long into the Supreme Court's interpretation of constitutional and Indian treaty rights.

The student is able to analyze the impact of removal and resettlement on the Cherokee, Creek, Chickasaw, Choctaw, and Seminole.

Indian students should be able to explain the terrible impact that the Removal Policy had on tribes. Indian people were uprooted from land they had known as their homes for centuries and were forced to leave behind their ways of life as well as the graves of their ancestors. Some of the tribes that were forcibly moved had even fought under General Andrew Jackson in the First Seminole War in exchange for a guarantee that they would not be removed. Ultimately, that guarantee was not honored. A huge number of Indians died along the journey west from exposure and sickness. Tribes were often divided when some members were removed to the west while others hid in order to remain in their homelands. Those individuals who did survive the harsh move had to establish new homes and communities in lands that were totally unfamiliar to them and very different

from anything their ancestors had known before. Students should contrast the survival strategies of those tribal groups who were removed with those of Indian groups/families which remained behind in the East.

The student is able to investigate the impact of trans-Mississippi expansion on Native Americans.

Indian students should understand that for most of their daily needs, the Plains tribes, like the Sioux and Cheyenne, relied heavily on the vast buffalo herds which roamed the northern Great Plains. In the 1840s, tensions began to grow between the Plains tribes and the emigrants traveling by wagon along the Oregon Trail. In the late 1840s and 1850s, other trails were created to take miners and settlers to California and Colorado. Settlers also began pouring in to Kansas and Nebraska. The wagon trains and influx of new people began pouring into Kansas and Nebraska. The wagon trains and influx of new people began driving the buffalo away from the traditional Indian hunting grounds. This began to have serious effects on tribal ways of life. Thus, friction between Indians and the new settlers and miners increased and in 1854 resulted in the first open warfare in the West between whites and Indians. By the close of the Civil War, this hemming in of the Plains tribes accelerated even more. Soon, the buffalo herds were totally destroyed by the newcomers and the Plains tribes were forced onto reservations. The cause-and-effect relationship of western expansion had taken a serious toll.

The student is able to explain and evaluate the various strategies of Native Americans such as accommodation, revitalization, and resistance.

Indian students should understand that Native American leaders faced many dilemmas in dealing with the relentless expansion of the United States. In general, the concerns of the tribal leaders had to do with protecting their people and preserving what they could of their ways of life. The strategies they implemented to do this depended on many things – their geographic location, their ability to muster military strength, their strategic importance to the United States, their desire for peace, the treatment they received at the hands of United States citizens and the military, and so on. Military resistance was often a last resort that occurred only when negotiations broke down or earlier treaty promises were broken. Indian students should understand the strategies employed by their own tribes and leaders in dealing with the United States' conquest of their lands. They should evaluate the short and long-term effects of those strategies on their tribes' histories and cultures.

The student understands various perspectives on federal Indian policy westward expansion, and the resulting struggles.

The student is able to identify and compare the attitudes and policies toward Native Americans by government officials, the U.S. Army, missionaries, and settlers.

Indian students should understand that during this period of American history, attitudes and policies toward Native Americans were largely paternalistic and focused on controlling Indians and forcing them to change. Native Americans were basically confined to their reservations and forced to adopt totally foreign ways of life – plow farming and ranching being notable examples. Federal Indian agents exerted a great deal of control on reservation lands. These agents were often corrupt, stealing the annuities and commodities which were intended for the Indian communities. Students should analyze this federal policy of assimilation, that is, forcing Native Americans to adopt the culture and ways of mainstream Americans. This effort was reinforced by various Christian religious denominations, who were given exclusive contracts to send missionaries to certain reservations. Missionaries often used assimilation strategies that were demeaning and brutal. Traditional religious practices were outlawed. This period of American history also saw the advent of the boarding school era, a time in which Native American children were forced to attend schools far from home and family, and where their traditional ways of life were totally banned and severe punishments were exacted for even speaking a tribal language.

Students should consult community oral histories and documents – such as autobiographies or scholarly research – which have recorded American Indian perspectives about these attitudes and policies.

The student is able to compare survival strategies of different Native American societies during the second great removal.

Indian students should understand that during the Civil War the federal government concluded that it was no longer feasible to allow the Western tribes a free existence; rather, it was decided that these Indians would have to give up their traditional nomadic lifestyle and accept living in confined reservation areas. Many tribes – including the Sioux, Northern Cheyenne, Kiowa, Comanche, Southern Cheyenne, Arapaho, and Western Apache – did not submit willingly to this new policy, and they remained largely unconquered until the 1880s. From 1866 to 1886, federal troops campaigned continuously against the Western tribes. Geronimo's Chiricahua Apache band was one of the last to hold out, not capitulating until 1886. Students should also be aware that after the Civil War, the Five Civilized Tribes of the Indian Territory acquiesced to the surrender of the western half of Indian Territory to the national government. This forced ceding of land was the government's penalty on tribes for their earlier alliances with the Confederate states. In fact, the Seminole were forced to cede their entire reservation to the United States. Federal officials wanted the western half of Indian Territory for the express purpose of relocating tribes from other sections of the west.

The student is able to explain the provisions of the Dawes Severalty Act of 1887 and evaluate its effects on tribal identity, land ownership, and assimilation.

Indian students should understand that the Dawes Severalty Act was another government attempt at forced assimilation of Indian people. The Act specifically attacked the

important traditional Native American social principal of communal land ownership. Dividing tribal lands among individual owners not only contradicted the traditional Indian concept of communal property, but it also affected tribal identity by undermining tribal cohesiveness. In addition, its implementation eroded the traditional Indian concept of extended family by separating family members from one another, sometimes by many miles. Students should examine the impact the Dawes Act had on their own tribe.

The student is able to evaluate the legacy of 19th –century federal Indian policy.

Indian students should understand that Indian policies of the late 19th century further damaged and brought turmoil into the lives of Indian people who were already reeling from the devastating effects of the Indian wars and forced life on reservations. Misguided attempts at assimilation had the effect of destroying community cohesiveness, undermining the social and cultural fabrics of tribes, and creating a sense of alienation. The actions of this era led to various social ills for many Indian people, including extreme poverty and alcoholism.

Each Indian student should understand the effect of 19th century federal Indian policy on his/her tribe's history – for example, in terms of treaties, warfare and changes in land bases.

The student understands the Second Reconstruction and its advancement of civil rights.

The student is able to evaluate the agendas, strategies, and effectiveness of various African Americans, Asian Americans, Latino Americans, and Native Americans, as well as the disabled, in the quest for civil rights and equal opportunities.

Indian students should understand that in the early 1950s the federal government initiated the Relocation and Termination Policies. The intent of these policies was, once again, to bring Indians into the American mainstream. The Relocation Policy encouraged, through job training programs, the movement of reservation Indians to major urban areas like Los Angeles, Chicago, Denver and Dallas. The Termination Policy's intent was to terminate the nation-to-nation relationship between tribes and the federal government. It resulted in withdrawal of federal support to affected tribes whether or not they wanted or were prepared for this. Responsibility for tribes was transferred to the states in which the tribes were located. In all, termination was imposed on about twelve tribes and bands before lawmakers were convinced by tribes and their allies to abandon the policy altogether.

-American Indian Content Standards, ORBIS Associates for Bureau of Indian Affairs.



for Language Arts-Based Units

FOR AND ABOUT CONTEMPORARY INDIAN YOUTH

When authors write fictional stories about people and their lives, the inclusion of inaccurate information and cultural bias is very possible. As students read about other young people, fictional or not, they need to be given positive and realistic images of them and depictions of situations that they, as youth, deal with. When culture is concerned, the author owes it to the people about whom he/she is writing to be as accurate as possible and not to be judgmental if the culture is different from their own. Today there are more books written about Indian youth. Teachers have to be careful to select those that will portray Indian young people in the best light and to tell the story of their cultural backgrounds accurately.

LITERATURE FOR UNIT -

Number Four by Molly Cone, Houghton Mifflin, 1972. **Northwest**

Finding One's Way: The Story of an **Abenaki** Child, Franklin Northwest Supervisory Union Title IV Indian Education Program, Abenaki Self-Help Association, 1987.

Slash by Jeanette Armstrong (**Indian Author**), Theytus, 1990.

High Elk's Treasure by Virginia Driving Hawk Sneve (**Indian Author**), Holiday House, 1972. **Lakota**

When Thunders Spoke by Virginia Driving Hawk Sneve (**Indian Author**), Holiday House, 1993. **Lakota**

Grandmother's Pigeon by Louise Erdrich (**Indian Author**), Hyperion. **Ojibwa**

Shannon: An **Ojibway** Dancer by Sandra King (**Indian Author**), Lerner, 1993.

Dancing Feathers by Cristel Kleitsch and Paul Stephens, Annick, 1987. **Ojibwa**

A Time to Be Brave by Cristel Kleitsch and Paul Stephens, Annick, 1987. **Ojibwa**

Less Than Half, More Than Whole by Kathleen and Michael Lacapa (**Indian Authors**), Northland, 1994. **Southwest**

Kinaalda: A **Navajo** Girl Grows Up by Monty Roessel (**Indian Author**), Lerner, 1993.

Pueblo Storyteller by Diane Hoyt-Goldsmith.

Dezbah and the Dancing Tumbleweed by Margaret Garaway. **Navajo**

When Grandfather Journeys into Winter by Craig Kee Strete (**Indian Author**), Greenwillow, 1979.

Thunder Bear and Ko: The Buffalo Nation and the **Nambe Pueblo** by Susan Hazen-Hammond.

Dream Quest by Amy Jo Cooper, Annick Press, 1987. **Ojibwa**

A Story to Tell: Traditions of a **Tlingit** Community, We Are Still Here Series, Lerner.

Weaving, A **California** Tradition, We Are Still Here Series, Lerner.

Powwow Summer by Marcie Rendon (**Indian Author**).

Navajo Wedding Day by Eleanor Schick.

Flying with the Eagle, Racing the Great Bear by Joseph Bruchac (**Indian Author**), Bridgewater Books, 1993.

The Girl Who Married the Moon by Joseph Bruchac and Gayle Ross (**Indian Authors**), Bridgewater Books, 1994.

My Name is Seepectza by Shirley Sterling (**Indian Author**), Groundwood Books, 1992. **Salish**

To Live in Two Worlds: American Indian Youth Today by Brent Ashabanner, Dodd, Mead, 1984.

Winners by Mary-Ellen Collura, Dial, 1984. **Blackfeet**

Owl in the Cedar Tree by Natachee Scott Momaday. **Navajo**

When Courage is Like a Wild Horse by Sharon and Manny Skalnack (**Indian Authors**), University of Nebraska Press.

Quest for Courage by Stormy Rudolph, Council for Indian Education.

Flint's Rock by Hap Gilliland, Council for Indian Education. **Cheyenne**

Becoming Brave: The Path to Native American Manhood by Laine Thom (**Indian Author**), Chronicle Books.

Dancing Colors: Paths of Native American Women by Laine Thom (**Indian Author**), Chronicle Books.

ACTIVITIES FOR READING FOR AND ABOUT CONTEMPORARY INDIAN YOUTH-

1. Have the class read a book about an Indian young person (young people) together, especially one about a youth from a tribe in their region. Have them utilize the literature circle process for discussing it plus answering the following questions. Is it fiction or nonfiction? If it is from their tribe or even from another tribe, can the students see any inaccuracies or bias? How are their lives the same or different from the youth in the book? Is the story a realistic picture of youth? What tribe is the young person (young people) in the book from? Where is that tribe located? Are there any lessons to be learned from the book? Is it written by an Indian author? Learn about the Indian author.
2. Have the class read a fiction book together if they have already read a nonfiction book or a nonfiction book if they have already read a fiction book. Have them utilize the literature circle process. Ask the same questions as listed above.
3. Assign the students various books that they are to read and share with the class. Have the students write book reports retelling the story and answering the same questions as above. Have the students present their book reports to the class.
4. Have the students respond to the literature and reflect on it by writing a poem, journaling or developing a media project.
5. Have the students write a short story about an Indian young person. Give them certain questions or an outline to follow. If they write a true story about themselves, what form of literature is it? Have them follow the writing process carefully as real authors do.
6. Have the stories published.
7. Have the students include their work in a writing portfolio system.

STUDENT WRITING

It is very important that Indian students become good writers. Many schools are trying harder to teach students to write well. There is a great need for Indian people to know how to write effectively. Tribal government workers, for example, acquire money and programs for the tribal members by writing proposals that must compete with others for funding. Some Indian young people may eventually make their living by writing; maybe they will be authors or news reporters and be able to tell the story of Indian people. All people need to be able to write well to function in society.

This unit will highlight the published works of Indian students. Some schools informally publish their student's work and that is just as important and should be included and read by other students. Student's written work should be published regularly.

LITERATURE FOR STUDENT WRITING UNIT-

Courageous Spirits: Aboriginal Heroes of Our Children by Jo-ann Archibald, Val Friesen and Jeff Smith (**Indian Author**), Theytus, 1993. **Canada**

Giving: **Ojibwa** Stories and Legends, Children of Curve Lake Reserve, Waapoone, 1985.

A Rainbow at Night: The World in Words and Pictures by **Navajo** Children by Bruce Hucko, Chronicle, 1996.

Byron Through the Seasons: A **Dene**-English Story Book, Children at Ducharme Elementary School, Fifth House.

We Are All Related: A Celebration of Our Cultural Heritage by George Littlefield (**Indian Author**).

When the Rain Sings: Poems by Young Native Americans by Lee Francis (**Indian Author**), Simon & Schuster, 1999.

Angwamas Minosewag **Anishinabeg**: Time of the Indian, students of the Red School House, Indian Country Communications, 1977.

Just Talking About Ourselves: Voices of Our Youth (Vols. 1, 2 & 3) by Marlana Dolan, Theytus, 1994.

Rising Voices: Writings of Young Native Americans by Arlene B. Hirschfelder (**Indian Author**) and Beverly Singer, Scribner, 1992.

It's Like My Heart Pounding: Imaginative Writing for American Indian Students by Mick Fedullo, Weber State College, 1990.

ACTIVITIES FOR STUDENT WRITING UNIT-

1. Have students read and respond to the works of other students from other places and/or classes.
2. Stress the use of a writing process such as: pre-writing, first draft, peer conference, revise, edit, publish, and share. Let them know that authors and students who have their works published follow this, or a similar, process.
3. Have students write poetry.
4. Have students write short stories.
5. Have the students publish their work including all of the steps necessary to print and sell them. Have them figure the cost of publishing their work in a booklet(s), how much they would have to charge for them, related costs.
6. Assign students various tasks, editing, illustrating, marketing, selling, etc.
7. Enter students' works in writing contests or in other opportunities to be published.
8. Have the students include their work in a writing portfolio system.

THE ORAL TRADITION AND ORATORY

Indian people are known for having an oral tradition. Even though they developed forms of writing, their main way of handing down history and stories was by telling such information to others. Indian people were also great orators. Although they usually used few words, their words sent powerful messages. Consider the following:

"Everything on earth has a purpose and every person a mission." - Mourning Dove, Salish

"I have seen that in any great undertaking it is not enough for a man to depend simply upon himself." - Lone Man, Lakota

"Your mother's the one that does everything for you. The Mother Earth does the same." - Lena Sooktis, Northern Cheyenne

"You must speak straight so that your words may go as sunlight into our hearts." - Cochise, Apache

"Somebody will always be looking at you as an example of how to behave. Don't let them down." - Karen Wynn, Yokuts

"Politeness goes far, yet costs nothing." - Seneca

"The more you know, the more you will trust and the less you will fear." - Medewiwin, Ojibway

"Live a quiet life and be kind to all, and listen to the advice of the old. People will respect you if you do this." - Nodinens, Chippewa

"My children, as you travel along life's road never harm anyone, nor cause anyone to feel sad." - Winnebago

"Teach children what is right to do and they will live that way and get on well in the world." - Chippewa

"If everyone did something for somebody else, there wouldn't be anyone in need in the whole world." - Marlene Richard, Tuscarora

"Knowledge is like the wind... once obtaining it you can go anywhere." - Yellow Horse

"The man who preserves his selfhood is ever calm and unshaken by the storms of existence." - Ohiyesa

"The ground on which we stand is sacred ground. It is the blood of our ancestors. - Chief Plenty Coups

LITERATURE FOR THE ORAL TRADITION AND ORATORY UNIT –

A Natural Education: Native American Ideas and Thoughts by Stan Padilla (**Indian Author**), Book Pub. Co., 1994.

Words of Power: Voices from Indian America by Norbert Hill, Jr. (**Indian Author**), Fulcrum Pub., 1994.

Indian Oratory: Famous Speeches by Noted Indian Chieftains compiled by W. C. Vanderwerth, University of Oklahoma Press, 1989.

Women of the Native Struggle: Portraits and Testimony of Native American Women by Ronnie Farley, Orion, 1993.

In the Trail of the Wind: American Indian Poems and Ritual Orations ed. by John Bierhorst, Dell, 1975.

ACTIVITIES FOR UNIT –

1. Have the students read and/or hear about how the oral tradition is important including learning from elders and sharing stories, knowledge and thoughts to keep the culture alive. Discuss the appropriate use of language in various situations and the effects of cultural context on language use.
2. Have the students read some of the Indian oratory presented here and in other books. Have them paraphrase the statements.
3. Have the students do research on those who made the statements, if known.
4. Have the students memorize some of the longer Indian oratorical statements and present them to the class, school or families and tell about the person who made the statement.
5. Encourage the students to present oratory in their Native language.
6. Have the students develop statements on topics they feel strongly about and present.
7. Have students write papers on why the oral tradition is important to them and to their tribe(s) and why it should be promoted to be presented to tribal council members.
8. Have the students include their writing in a writing portfolio system.

INDIAN STORIES

As a part of the oral tradition, Indian people told stories. Their stories often taught lessons to the young people. Grandparents were most often the storytellers. Some stories were very long and could not be told in one sitting. Stories were usually only told at certain times, mainly in the wintertime. Indian stories are often referred to as legends, stories coming down from the past. It is important to preserve the Indian stories and storytelling among Indian people.

"Legends are an important and integral part of the Native American culture. Legends are a vehicle for teaching young people lessons and proper behavior, maintaining and recording Indian community history and an oral preservation of traditional beliefs and values explaining natural phenomenon and teaching respect to the natural world. All Indian tribes have recognized the importance of preserving this oral tradition."

— Legends Across Indian Nations, ORBIS Associates, Washington, DC.

LITERATURE FOR INDIAN STORIES UNIT -

One More Story: Contemporary **Seneca** Tales of the Supernatural by Du Wayne Leslie Bowen (**Indian Author**), Greenfield Review, 1991.

Iroquois Stories: Heroes and Heroines, Monsters and Magic by Joseph Bruchac (**Indian Author**), Crossing, 1985.

Native Animal Stories or Keepers of the Animals by Joseph Bruchac (**Indian Author**), Fulcrum. **Many tribes**

Native American Stories or Keepers of the Earth by Joseph Bruchac (**Indian Author**), Fulcrum. **Many tribes**

Native Plant Stories or Keepers of Life by Joseph Bruchac (**Indian Author**), Fulcrum. **Many tribes**

Keepers of the Night by Michael Caduto and Joseph Bruchac (**Indian Author**), Fulcrum, 1994. **Many tribes**

Stone Giants and Flying Heads: Adventure Stories from the **Iroquois** by Joseph Bruchac (**Indian Author**), Crossing, 1979.

The Wind Eagle and Other **Abenaki** Stories by Joseph Bruchac (**Indian Author**), Bowman, 1985.

When the Chenoo Howls by Joseph Bruchac (**Indian Author**), Walker Books.

Son of Raven, son of Deer by George Clutesi (**Indian Author**), Clutesi Agencies, 1994.
Northwest

Adventures of Nanabush: **Ojibway** Indian Stories by David Coatsworth, Atheneum, 1979.

Seneca Indian Stories by Leo Cooper, Ha-yen-doh-nees (**Indian Author**), Bowman, 1995.

Lakota and Dakota Wisdom Stories by Mark W. McGinnis and Pamela Greenhill Kaizen (**Indian Author**), Tipi, 1994.

Old Father Story Teller by Pablita Velarde (**Indian Author**), Clear Light, 1989. **Pueblo**

Skunny Wundy: **Seneca** Indian Tales by Arthur C. Parker (**Indian Author**), Syracuse University, 1994.

Coyote Stories of the **Navajo** People by Robert A. Roessel and Dillon Platero (**Indian Author**), Rough Rock, 1973.

The Princess and the Sea Bear and Other **Tsimshian** Stories by Joan Skogan, Polestar, 1992.

The Snake That Lived in the Santa Cruz Mountains and Other **Ohlone** Stories by Linda Yamane (**Indian Author**), Oyate, 1998.

American Indian Stories by Gertrude Bonin, Zitkala-Sa (**Indian Author**), University of Nebraska Press, 1979. **Dakota**

Old Indian Legends by Gertrude Bonin, Zitkala-Sa (**Indian Author**), University of Nebraska Press, 1985. **Dakota**

Grandfather's Story of **Navajo** Monsters by Richard Red Hawk (**Indian Author**), Sierra Oaks.

Creation of a **California** Tribe by Lee Smith and Clifford E. Trafzer (**Indian Authors**), Sierra Oaks.

The Boy Who Made Dragonfly by Tony Hillerman, University of New Mexico Press, 1972. **Zuni**

Earthmaker's Lodge: American Indian Folklore, Activities and Foods by Barrie Kavasch.
Many tribes

Skywoman: Legends of the **Iroquois** by Joanne Shenandoah (**Indian Author**) and others, 1998.

Myths and Legends of the **Sioux** by Marie L. MacLaughlin, Tumbleweed Press.

Earth Lodge Tales from the Upper Missouri: Traditional Stories of the **Arikara, Hidatsa** and **Mandan**, Mary College.

Navajo Coyote Tales by William Morgan (**Indian Author**).

Stories of the **Sioux** by Luther Standing Bear, University of Nebraska.

Stories of the Metis by B. Sealey, Manitoba **Metis** Federation Press.

Two Old Women by Velma Wills, Harper Perennial, 1993. **Athabaskan**

Medicine Boy and Other **Cree** Tales by Eleanor Brass (**Indian Author**), Glwnbow, 1989.

Traditional Indian Stories by Priscilla Buffalohead, Anoka-Hennepin Indian Education Program, Minnesota.

The Bear-Walker and Other Stories, The Star-Man and Other Tales, Tales of the Anishinaubaek by Basil Johnson (**Indian Author**), Royal Ontario Museum. **Ojibwa**

The Story Catcher by Mari Sandoz, 1963. **Lakota**

Six **Micmac** Stories by Ruth Holmes Whitehead, Nova Scotia Museum, 1992.

Earth Elder Stories by Alexander Wolfe (**Indian Author**), Fifth House, 1989.

Achimoona by Maria Campbell (**Indian Author**), Fifth House, 1985.

Indian Legends from the **Northern Rockies** by Ella E. Clark, Univ, of Okla. Press, 1966.

The Sound of Flutes by Richard Erdoes, Pantheon, 1976. **Lakota**

Saanii Dahataal/ The Women Are Singing by Luci Tapahonso (**Indian Author**). Univ. of Ariz., 1993. **Navajo**

Check your library or bookstores for other books of Indian legends, especially those of the local tribe(s).

ACTIVITIES FOR INDIAN STORIES UNIT-

1. Have the students read and discuss Indian stories, mainly from their own local tribe(s) or regions. Do they teach lessons? When are they to be told? Who compiled the stories? Discuss the effects of cultural contexts on communication.
2. Have the students verify the accuracy of the stories from local tribes by conferring with tribal elders, etc. There may be other versions that are more accepted by the local people.
3. If it is the appropriate time, have an elder(s) visit the classroom and tell stories.
4. Have the students retell stories to promote the oral tradition in a theatre setting. Encourage them to tell stories in their Native language.
5. Have the students ask their parents to relate stories they heard when they were young.
6. Have the students create a booklet of tribal stories. Have them use the writing process so it will be as professional as possible.

INDIAN BIOGRAPHIES

It is important that Indian children know about modern Indian people who are known for their accomplishments. Knowing their successes and how they overcame adversity should help to motivate and support young Indian people. Biographies and autobiographies included here are the stories of Indian artists, writers, tribal and other government officials, activists, performing artists, athletes, scientists and a medicine man. Students also need to know the biography/autobiography as a form of literature.

LITERATURE FOR INDIAN BIOGRAPHIES UNIT-

Tending the Fire: The Story of Maria Martinez by Juddi Morris. **Pueblo Potter**

Helen Cordero and the Storytellers of **Cochiti Pueblo** by Nancy Howard.

This Land Is My Land by George Littlechild (**Indian Author & Artist**), Children's Book, 1993. **Cree**

R. C. Gorman-**Navajo** Artist available from Four Winds Books, York, NE.

Patrick DesJarlait: Conversations with a Native American Artist by Neva Williams, Runestone, 1994. **Ojibway**

Bowman's Store: A Journey to Myself by Joseph Bruchac (**Indian Author**), Dial, 1997. **Abenaki**

Halfbreed by Maria Campbell (**Indian Author**), University of Nebraska Press, 1973.

The Names: A Memoir by N. Scott Momaday (**Indian Author**), Harper & Row, 1976

Ben Nighthorse Campbell-**Cheyenne** Chief; U.S. Senator, Native American Indians of Achievement Series.

Peter Macdonald-Former Chairman of the **Navajo** Nation, Native American Indians of Achievement Series.

Wilma Mankiller-Principal Chief of the **Cherokee**, Native American Indians of Achievement Series.

Wilma Mankiller by Jacki Thompson Rand, Native American Stories, Raintree Pub.

Dennis Banks-Native American Activist, available from Four Winds Books, York, NE. **Ojibwa**

Will Rogers-**Cherokee** Entertainer, available from Four Winds Books, York, NE.

Will Rogers: Larger Than Life by Debbie Dodey, 1999.

Maria Tallchief-**Osage** Prima Ballerina, available from Four Winds Books, York, NE.

Maria Tallchief by Heidi Erdich, Native American Stories, Raintree Pub. **Osage**

Jim Thorpe-**Sac & Fox** Athlete, Native American Indians of Achievement Series.

Jim Thorpe by Edward F. Rivinus, Native American Stories, Raintree Pub. **Sac & Fox**

James Joe, **Navajo** Medicine Man by Susan Thompson

Katie Henio, **Navajo** Sheepherder by Peggy Thompson, Cobblehill, 1995.

Scientist from **Santa Clara Pueblo**: Agnes Naranjo Stroud-Lee by Mary Ellen Verheyden-Hilliard, 1985.

Engineer from the **Comanche** Nation: Nancy Wallace by Mary Ellen Verheyden-Hilliard, 1985.

Encyclopedia of Native American Biography by Bruce Johnson & Donald Grinde, Jr.

An Album of the American Indian by Rosebud Yellow Robe (**Indian Author**), Franklin Watts, 1969

A Time for Native Americans, Four Biographical Card Games available from Four Winds Indian Books.

Great Native Americans by Peter Copeland.

A to Z of **Native** American Women by Liz Sonneborn.

American Indian Lives Series: Artists and Craftspeople; Athletes; Performers; Political Leaders and Peacemakers; Scholars, Writers, and Professionals; Spiritual Leaders; Healers; Reformers and Activists available from Four Winds Books, York, NE.

Extraordinary American Indians by Susan Avery and Linda Skinner (**Indian Author**).

Women of the Native Struggle: Portraits and Testimony of Native American Women by Ronnie Farley, Orion, 1993.

ACTIVITIES FOR INDIAN BIOGRAPHIES UNIT-

1. Have the students read one of the biographies or autobiographies together, especially if it is about someone of a local tribe. Use literature circle strategies.
2. Assign various biographies/autobiographies to the students. Have the students be responsible for informing other students about the people they are reading about by preparing written reports and giving presentations. Have a set of questions to use to gather information from their assigned auto/biographies.
3. Have the students determine if their biography is written by an Indian author. Have them do research on the author and report. Were there any biases or possible inaccuracies detected in works by nonIndian authors?
4. Have the students pinpoint on a map the various tribes represented by the people they are reading about. Have them figure how far away from their homes some of them went to live, go to school or work.
5. Have the students find how many Indian people there are in the United States and what percent of the total population they comprise. Have them discuss the need for Indian professionals in all areas because of the struggles Indian people have as a small group in this country. Have them list and discuss Indian professionals they know in various fields.
6. Have the students search to locate biographies or biographical information on Indian people from the local tribe(s), read and report in the tribal newspaper.
7. Have the students interview people in the community and write short biographies about them. Have the students prepare a list of the questions they will all ask. Have the students utilize a writing-editing process. Publish a book of biographies of local people.
8. Have the students include their written works in a writing portfolio system.

POETRY BY INDIAN AUTHORS

There are many Indian poets. Indian young people should know and read their poetry. Poetry provides a special way to communicate feelings and can provide a way for young people to connect with and recognize others' feelings and thoughts.

LITERATURE FOR POETRY BY INDIAN AUTHORS UNIT –

Songs from This Earth on Turtle's Back ed. by Joseph Bruchac (**Abenaki**), Greenfield Review Press, 1983.

Dancing on the Rim of the World: Anthology of Northwest Native American Writing, University of Arizona Press, 1990.

Harper's Anthology of 20th Century Native American Poetry ed. by Duane Niatum (**Klallam**), Harper & Row, 1988.

Braided Lives: An Anthology of Multicultural American Writing, Minnesota Humanities Commission, 1991.

In Mad Love and War by Joy Harjo (**Creek**), Wesleyan University Press, 1990.

A Breeze Swept Through by Luci Tapahonso (**Navajo**), University of Arizona Press, 1987.

S'aanii Dahataal/The Women Are Singing by Luci Tapahonso (**Navajo**), University of Arizona Press, 1993.

A Cheyenne Sketchbook: Selected Poems 1970-1991 by Lance Henson (**Southern Cheyenne**), Greenfield Review Press, 1992.

A Quick Brush of Wings by Mary Tallmountain (**Athabaskan**), Freedom Voices.

Riding the Earthboy 40 by James Welch (**Blackfeet/Gros Ventre**), Confluence Press, 1971.

Clans of Many Nations: Selected Poems 1969-1994 by Peter Blue Cloud (**Mohawk**), White Pine.

Native North American Literary Companion by Joseph Bruchac (**Abenaki**) and Janet Witalec, Visible Ink, 1998.

Contemporary Native American Authors: A Biographical Dictionary, CRC Publishing Co., Eagle Rock Books. 800 268-2059

ACTIVITIES FOR POETRY BY INDIAN AUTHORS UNIT –

1. Have students read poetry selected by the teacher for all students to read. Students should understand the speaker, the meanings of words, the grammar and punctuation, and the organization of the total composition. Students should feel the actual sounds and rhythm of the poem's language and its appeal to their senses. Students should "experience" the poetry and understand that people respond differently to literature.
2. Have the students respond and reflect upon poetry by presenting a role play, journaling, or doing a media project.
3. Have students choose selections that they wish to read and prepare at least one reading and response to be presented to the class.
4. Have students report on the Indian authors they have read.
5. Have students do research to find poetry by local tribal members and develop a relationship/correspond with those poets.
6. Have students write their own poetry and publish it. If there is a tribal happening that could be a topic, poetry on that topic could be presented to the tribal council and published in a commemorative booklet.
7. Have the students include their writing in a writing portfolio system.

SHORT STORIES BY INDIAN AUTHORS

There are Indian authors of short stories. Indian young people should know and read their work. A story presents us with a world of the author's imagination. The author combines people, places, events and ideas to create a unique, fictional world. In putting these parts together to form a story, the author wants to illustrate a truth – a generalization – about life. A good short story presents enough lifelike qualities to help us better understand ourselves and our world. A short story should be readable in one sitting. The author works with basic elements: plot, character, setting, point of view, and theme.

LITERATURE FOR SHORT STORIES BY INDIAN AUTHORS UNIT –

The Bleeding Man and Other Stories by Craig Kee Strete (**Indian Author**), Greenwillow, 1977.

Braided Lives: An Anthology of Multicultural American Writing, Minnesota Humanities Commission, 1991.

The Hawk is Hungry and Other Stories by D'Arcy McNickle (**Salish**), University of Arizona Press, 1992.

The Power of Horses and Other Stories by Elizabeth Cook-Lynn (**Dakota**), Arcade, 1990.

That's What She Said: Contemporary Poetry and Fiction by Native American Women ed. by Rayna Green (**Cherokee**) Indiana University Press, 1984.

The Man To Send Rainclouds: Contemporary Stories by American Indians ed. by Kenneth Rosen, Vintage Books, 1975.

A Circle of Nations: Voices and Visions of American Indians, North American Native Writers and Photographers by John Gattuso, Beyond Words.

American Indian Literature: An Anthology by Alan R. Velie, University of Oklahoma Press, 1991.

Plains Native American Literature Multiculture Literature Collection ed. by Virginia Seeley, Globe, 1993.

Native North American Literary Companion by Joseph Bruchac (**Abenaki**) and Janet Witalec, Visible Ink, 1998.

Talking Leaves: Contemporary Native American Short Stories ed. by Craig Lesley, Laurel, 1991.

ACTIVITIES FOR SHORT STORIES BY INDIAN AUTHORS UNIT –

1. Have the students read short stories selected by the teacher. Let them know the purpose for the reading. Have them discuss the plot, characters, setting, point of view and theme. Have them predict. Have them determine if the story(ies) offer a generalization about life. Have them evaluate the stories and recognize that people respond differently to literature.
2. Have the students choose and read other short stories. Have them prepare a report about the stories they have chosen.
3. Have the students do research and report on the authors of the stories.
4. Have the students write short stories and have them published. Have them use writing and editing process. Have them exchange stories with students in other schools.
5. Have the students including their writing in a writing portfolio system.
6. Have the students research to find local short story authors and establish a relationship with them including having them visit the class.

NOVELS BY INDIAN AUTHORS

There are Indian novelists. Indian young people should know and read their work. Because of its length, a novel can picture life with all of its richness, complexity, and contradiction. A novel uses the same elements as a short story: plot, character, setting, point of view, and theme. But the greater length of the novel allows novelists to deal with more complex aspects of these elements.

LITERATURE FOR NOVELS BY INDIAN AUTHORS UNIT -

The Owl's Song by Janet Campbell Hale (Coeur d'Alene), Bantam Books, 1991.

Runner in the Sun: A Story of Indian Maize by D'Arcy McNickle (**Salish**), University of New Mexico Press, 1987.

My Name is Seepeetza by Shirley Sterling (**Salish**), Groundwood Press, 1992.

Green March Moons by Mary TallMountain (**Athabaskan**), New Seed Press, 1987.

Children of the Longhouse by Joseph Bruchac (**Abenaki**), Dial, 1996.

In the Time of the Wolves by Eileen Charbonneau (**Cherokee**), Tom Doherty, 1994.

The Ghosts of Stony Clove by Eileen Charbonneau (**Cherokee**), 1988.

From the River's Edge by Elizabeth Cook-Lynn (**Dakota**), Arcade, 1991.

Waterlily by Ella Cara Deloria (**Dakota**), Dakota Press, 1992.

Fools Crow by James Welch (**Blackfeet-Gros Ventre**), Viking, 1986.

Winter in the Blood by James Welch (**Blackfeet-Gros Ventre**), Viking, 1987.

Slash by Jeanette Armstrong (**Okanagan**), Theytus, 1991.

Silent Words by Ruby Slipperjack (**Ojibway**), Pemmican, 1987.

Pachee Goyo: History and Legends from the Shoshone by Rupert Weeks (**Shoshone**), Jelm Mountain Press, 1981.

The Window by Michael Dorris (**Modoc**), Hyperion.

ACTIVITIES FOR NOVELS BY INDIAN AUTHORS UNIT -

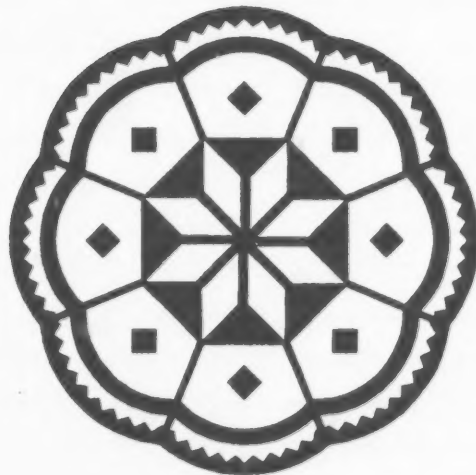
1. Have the students read a novel together. Utilize literature circle strategies. What do they already know about the book and the topic? Have them discuss the plot, character, setting, point of view, and theme. Have them respond.
2. Have the students select novels to read. Have them prepare a report to be presented to the rest of the class. Have them explain the purpose of the reading, their response and discuss the plot, character, setting, point of view, and theme.
3. Have the students do research on Indian authors and report. The book Contemporary Native American Authors: A Biographical Dictionary should include most Indian authors. Books including works of Indian authors should have some information on them. Have the students keep a list of all of the Indian novelists and their works.
4. Have the students locate Indian novelists and establish relationships with them through correspondence, etc.
5. Have the students write an article about their Novels by Indian Authors unit for the tribal newspaper.

SOME AMERICAN INDIAN/ALASKA NATIVE AUTHORS

- | | |
|--|------------------------------------|
| Sherman Alexie (Spokane/Coeur d'Alene) | Maurice Kenny (Mohawk) |
| Annette Arkeketa West (Otoe_Creek) | Thomas King (Cherokee) |
| Jeanette Armstrong (Okanagan) | Michael Lacapa (Apache/Hopi) |
| Marilou Awiakta (Cherokee) | Carol Lee Sanchez (Laguna/Sioux) |
| Moses Nelson Big Crow (Lakota) | D'Arcy McNickle (Salish) |
| Duane Big Eagle (Osage-Sioux) | Leslie Marmon Silko (Laguna) |
| Gloria Bird (Spokane) | Tiffany Midge (Standing Rock) |
| Peter Blue Cloud (Mohawk) | Judith Minty (Mohawk) |
| Beth Brant (Mohawk) | N. Scott Momaday (Kiowa) |
| Joseph Bruchac (Abenaki) | Judith Volborth (Apache/Comanche) |
| Diane Burns (Anishinabe) | Duane Niatum (S'Kallam) |
| Barney Bush (Shawnee-Cayuga) | Jim Northrup (Anishinabe) |
| Maria Campbell (Metis) | Simon Ortiz (Acoma Pueblo) |
| Janet Campbell Hale (Coeur D'Alene) | William S. Penn (Nez Perce) |
| Gladys Cardiff (Cherokee) | Russell Peters (Wampanoag) |
| Eileen Charbonneau (Cherokee) | Susan K. Power (Standing Rock) |
| Elizabeth Cook-Lynn (Dakota) | Juane Quick-to-See Smith (Salish) |
| Beatrice Culleton (Metis) | Carter Revard (Osage) |
| Nora Dauenhauer (Tlingit) | Mickey Roberts (Nooksack) |
| Charlotte de Clue (Osage) | Wendy Rose (Hopi-Miwok) |
| Ella Cara Deloria (Dakota) | Gayle Ross (Cherokee) |
| Vine Deloria, Jr. (Dakota) | Greg Sarris (Pomo-Miwok) |
| Michael Dorris (Modoc) | Cheryl Savageau (Abenaki/Metis) |
| Virginia Driving Hawk Sneve (Lakota) | Kathleen Shaye Hill (Klamath) |
| Debra Earling (Flathead) | Ruby Slipperjack (Ojibway) |
| Ed Edmo (Shoshone-Bannock) | Shirley Sterling (Salish) |
| Anita Endrezze (Yaqui) | Virginia Stroud (Cherokee) |
| Louise Erdrich (Ojibwa) | Mary TallMountain (Athabaskan) |
| Lee Francis (Laguna Pueblo) | Luci Tapahonso (Navajo) |
| Tina Freeman-Villalobos (Modoc) | Clifford Trafzer (Wyandott) |
| Diane Glancy (Cherokee) | Paula Underwood Spencer (Oneida) |
| Rayna Green (Cherokee) | Richard Van Camp (Dogrib) |
| Paula Gunn Allen (Pueblo- Sioux) | Gerald Vizenor (Ojibwa) |
| Ruth Ann Hall (Hidatsa) | Anna Lee Walters (Pawnee/Otoe) |
| Joy Harjo (Muscogee) | Rupert Weeks (Shoshone) |
| Lance Henson (Cheyenne) | James Welch (Blackfeet/GrosVentre) |
| Roberta Hill Whiteman (Oneida) | Baje Whitethorne (Navajo) |
| Shirley Hill Witt (Mohawk) | Darryl Babe Wilson (Pitt River) |
| Linda Hogan (Chickasaw) | Phyllis Wolf (Assiniboine/Ojibway) |
| Beverly Hungry Wolf (Blackfeet) | Elizabeth Woody (Wasco-Navajo) |
| Roger Jack (Colville) | Ray Young Bear (Mesquakie) |
| Rita Joe (Micmac) | Ofelia Zepeda (Tohono O'odham) |



Language
Arts & Math
Standards
Addressed in Creating
Sacred Places for Students
in Grades 7 & 8



LANGUAGE ARTS STANDARDS ADDRESSED IN CREATING SACRED PLACES FOR STUDENTS IN GRADES 7 & 8 –

Standard – Gathers information effectively through reading, listening and viewing **Benchmarks –**

- Determines whether elements of a text are realistic
- Understands written information containing mathematics concepts
- Understands abstract concepts presented visually
- Makes and confirms/disconfirms complex predictions about what will be found in a text
- Generates interesting questions to be answered while reading, listening, observing
- Identifies those situations in which the student is confused while reading, listening
- Reflects on what has been learned after reading, listening, observing
- Organizes prior knowledge of a topic before reading, listening or viewing
- Seeks peer help to understand information
- Independently identifies explicit purpose for reading, listening or viewing
- Identifies information organizing strategies that are personally most useful
- Gathers and synthesizes data from interviews
- Gathers information using note taking

Standard – Reads and responds to literature

Benchmarks –

- Recognizes when a particular part of a literary text has a personal impact
- Selects an effective mode to communicate personal reaction to a piece of literature (e.g., a skit, a poem, role play)
- Understands that people respond differently to literature
- Identifies specific questions of personal importance and seeks to answer them through literature
- Identifies specific interests and the literature that will satisfy those interests

Standard – Communicates ideas and information in writing

Benchmarks –

- Identifies specific stylistic and rhetorical characteristics of “good” literature and utilizes them in own writing (e.g., descriptive phrases, use of foreshadowing)
- Writes for a variety of audiences including self, well-known others and broader reading public
- Uses technical terms and notation in writing
- Uses specific pieces of literature as vehicles for future writing topic development
- Uses direct feedback from peers to revise content of a composition
- Makes informed decisions about which works to place in a portfolio representing various aspects of composing ability
- Constructs oral histories
- Expresses complex information in narrative form

Standard – Understands and applies basic principles of language use

Benchmarks –

Forms explicit conclusions regarding language use based on observation

Understands those factors that commonly affect the use of language

Communicates effectively in more than one language or dialect

- McREL Compendium of Standards, The Systematic Identification and Articulation of Content Standards and Benchmarks, 1994.

**AMERICAN INDIAN LANGUAGE AND LITERACY CONTENT STANDARDS
ADDRESSED IN CREATING SACRED PLACES FOR STUDENTS IN 7 & 8 –**

Indian students should show growth and increasing sophistication in:

Understanding and using forms and features of language that vary within and across individual speakers, diverse cultural communities, and different situations.

Developing and applying Native language literacies while developing/applying English literacies.

Understanding the effects of cultural contexts, particularly of their tribe, on what students read, write, hear, say, and view.

Listening, speaking, writing, and responding respectfully but critically in large and small groups.

Becoming aware of, monitoring, reflecting on, and articulating their own processes and strategies in reading, writing, listening, and speaking.

Developing oral communication skills to perpetuate the American Indian oral tradition.

Analyzing, evaluating, and assessing what they read, write, hear, say and view – e.g., comparing American Indian and non-Indian perspectives in historical records.

Reading popular and classical literature from diverse cultures and times, especially American Indian literature, for a variety of purposes and in a variety of genres, and becoming aware of the ways readers and writers are influenced by personal, social, cultural, and historical contexts.

Developing multiple strategies to appreciate, interpret, and critique various types of literature and of the print and nonprint text, including student work – e.g., evaluating literature with Indian themes by non-Indian writers in contrast with literature by Indian writers.

Recognizing, reflecting on, and articulating their participation in the aesthetic dimensions of literature.

Writing for a variety of real world purposes and audiences and in a variety of genres, including those which allow them to communicate well in their own communities.

Learning, understanding, and using formal conventions of English.

Understanding the origin and structure of language to become more proficient users of language.

Using a range of technological forms of communication and understanding and evaluating critically the conventions, demands, opportunities, and responsibilities of technologically based discourse.

Exploring ideas and feelings imaginatively through a variety of creative modes, e.g. journals, story telling, drama, and media projects.

Defining, synthesizing, hypothesizing, drawing conclusions, and evaluating within the use of multiple resources.

Building upon Native language and experience in school learning.

- American Indian Content Standards developed for the Bureau of Indian Affairs, Office of Indian Education Programs by ORBIS Associates, Washington, DC.

MATHEMATICS STANDARDS TO BE ADDRESSED IN CREATING SACRED PLACES FOR STUDENTS IN GRADES 7 & 8 –

Standard – Effectively uses a variety of strategies within the problem solving process

Benchmarks –

- Identifies a similar problem type to solve a problem
- Breaks larger problems into smaller problems
- Works backwards from the solution to solve a problem
- Uses substitution within given formulas and expressions
- Represents problems using geometric models
- Identifies similarities and differences between a wide variety of problem types and problem solving strategies
- Effectively verifies solutions or results in situations where it is warranted

Standard – Understands and applies basic and advanced properties of numbers

Benchmarks –

- Understands the similarities and differences between rational numbers and irrational numbers
- Understands the role of integers in the number system
- Understands the relationship of prime numbers to other numbers
- Understands the similarities and differences between fractions, ratios, proportions and percents
- Solves problems involving fractions
- Solves problems involving proportions
- Solves problems involving percents
- Expresses numbers using scientific notation
- Models numbers using two-dimensional regions

Standard – Uses basic and advanced procedures while performing the process of computation

Benchmarks –

- Adds, subtracts, multiplies, divides mixed numbers and fractions
- Rounds decimals and fractions
- Mentally multiplies and divides basic combinations of whole numbers with reasonable accuracy
- Uses basic estimation techniques (i.e., overestimate, underestimate, range of estimations)
- Uses order operations effectively
- Selects appropriate computational techniques in problem solving situations (i.e., paper/pencil/calculator/computer)
- Understands the similarities and differences between multiples and factors

Standard – Understands and applies basic and advanced methods of measurement

Benchmarks –

- Has a basic understanding of the concept of rate and how it is measured
- Understands the basic characteristics of perimeter and how it is measured
- Understands the characteristics of different types of surface area and how they are measured
- Makes effective use of meter stick for making measurements
- Converts from one measurement system to another
- Determines significant digits in measurement
- Determines the level of accuracy needed in measurement situations
- Determines appropriate forms of measurement in a variety of situations

Standard – Understands and applies basic and advanced concepts of geometry

Benchmarks –

- Understands the basic characteristics of the concept of symmetry
- Understands the relationship between distance and midpoint
- Understands the basic characteristics of slope
- Performs algebraic translations/rotations/reflections of geometric shapes
- Analyzes effects of flips, turns, slides in geometric shapes
- Analyzes the intersection of two-dimensional figures
- Visualizes geometric figures in various rotations

Standard – Understands and applies basic and advanced concepts of data analysis and distributions

Benchmarks –

- Understands the basic features of distribution
- Understands basic characteristics of measures of central tendency (mean, median, mode)
- Understands similarities and differences between tables, bar graphs and circle graphs

Standard – Understands and applies basic and advanced concepts of probability and statistics

Benchmarks –

- Understands the basic features of a sample and sampling error
- Estimates probability using simulation
- Identifies common errors in the presentation of statistics

Standard – Understands and applies basic and advanced properties of functions and algebra

Benchmarks –

- Understands the basic features of mathematical expressions
- Understands the basic features of coordinates
- Has a basic understanding of the concept of equation
- Understands characteristics and uses of the concept of rectangular coordinates
- Solves problems involving rectangular coordinates
- Solves problems involving formulas with one variable

AMERICAN INDIAN MATHEMATICS STANDARDS TO BE ADDRESSED IN CREATING SACRED PLACES FOR STUDENTS IN GRADES 7 & 8 –

Mathematics As Problem Solving –

Indian students should use problem-solving approaches to investigate and understand mathematical content and relate it to the American Indians' application of mathematical knowledge, for example, the use of symmetry in traditional beadwork designs.

Indian students should develop and apply a variety of strategies to solve problems, with emphases on multistep and nonroutine problems and relate problem solving to community or Tribal economic issues.

Mathematics As Communication –

Indian students should model situations using oral, written, concrete, pictorial, graphical, and algebraic materials based on early American Indian trading and bartering systems.

Indian students should discuss mathematical ideas and make conjectures and convincing arguments such as explaining the use of various geometric figures in the design of traditional American Indian homes.

Indian students should appreciate the value of mathematical notation and its role in the development of mathematical ideas through conducting simple exercises in using the Mayan base 5-20 number system as compared to the Hindu-Arabic base 10 system.

Mathematics As Reasoning –

Indian students should recognize and apply inductive and deductive reasoning and relate reasoning to applicable statistics such as that which pertains to an economic base – tourism, timber, manufacturing, fishing, crafts, etc.

Mathematical Connections –

Indian students should explore problems and describe results using graphical, numerical, physical, algebraic, and verbal mathematical models or representations and relate problems to tribal demographics.

Indian students should apply mathematical thinking and modeling to solve problems that arise in other disciplines, such as American Indian music, art, and tribal-related business.

Indian students should value the role of mathematics in culture and society, especially in their tribal communities.

Number And Number Relationships –

Indian students should understand, represent, and use numbers in a variety of equivalent forms (integer, fraction, decimal, exponential; and scientific notation) in real-world and mathematical problem situations; use articles from tribal or national Indian newspapers to generate practice problems.

Number Systems And Number Theory –

Indian students should understand that basic arithmetic operations are related to one another and relate them to the American Indian concept of balance – i.e., addition is the opposite of subtraction, multiplication is repeated addition and division is the opposite of multiplication and repeated subtraction.

Computation And Estimation –

Indian students should use computation, estimation, and proportions to solve problems at home and in the tribal community.

Patterns and Functions –

Indian students should describe, extend, analyze, and create a wide variety of patterns related to American Indian artistic and functional designs.

Algebra –

Indian students should apply algebraic methods to solve a variety of problems in their home/Tribal worlds and relative to the students' personal interests.

Statistics –

Indian students should systematically collect, organize, describe data and create a database from local tribal or national Indian demographic information that is relevant.

Indian students should construct, read, and interpret tables, charts and graphs based on historical and contemporary American Indian subject matter – e.g., demographic trends among American Indian populations by state from the mid 1800's to today.

Indian students should make inferences and convincing arguments that are based on analysis of data they have assemble on American Indian subject matter.

Indian students should develop an appreciation for statistical methods as powerful means for decision making presented through examples utilized by the tribal council/community and creating databases through a partnership with community and government agencies.

Probability –

Indian students should devise and conduct experiments or simulations to apply probabilities concepts/principles to tribal economic development and other community interests.

Indian students should appreciate the power of probability models by comparing the results of experimental simulations and probability expectations, related to projected revenue generated from tribal enterprises or classroom enterprises, such as a raffle sale.

Indian students should make predictions that are base on experimental or theoretical probabilities and relate the experiments to tribal or national Indian demographical information, and school and classroom demographics.

Geometry –

Indian students should identify, describe, compare, and classify geometric figures from various American Indian art forms to learn concepts related to plane and solid geometry. (Examples – Seminole patch work quilting, Lakota star quilts, Pueblo pottery designs)

Indian students should use geometric figures to develop spatial sense by designing their own geometric models/designs that emulate traditional American Indian art forms.

Measurement –

Indian students should understand the structure and use of systems of measurement related to historical American Indian bartering systems and community housing authorities and other present day tribal/community applications of measurement.

Indian students should extend their understanding of the concepts of perimeter, area, volume, angle measure, capacity, and weight and mass as they relate to an examination of traditional American Indian objects, such as pottery, drums, rattles or baskets.

- American Indian Content Standards Developed for the Bureau of Indian Affairs, Office of Indian Education Programs by ORBIS Associates, Washington, DC

WHERE TO GET BOOKS

North American Native Authors Catalog, Greenfield Review Press, P.O. Box 308, Greenfield Center, New York 12833 (518) 583-1440 <http://nativeauthors.com>

Indian Books Catalog, Four Winds Indian Books, P.O. Box 544, York, NE 68467-0544 (402) 362-5654 <http://www.fourwindsbooks.com>

Amazon.com Bookstore and bookcenter@nativeweb.org All selections are linked directly to Amazon.com bookstore so that you may purchase them online at a discount.

Prairie Edge Book and Music List, Prairie Edge, 6th & Main, Rapid City, SD 57701 (800) 541-2388 prairie@rapidnet.com www.prairieedge.com

Native American Catalog, Book Publishing Company, P.O. Box 99, Summertown, TN 38483 (931) 964-3571 bookpubl@usit.net

The Native Book Centre, 150 York Hill Blvd., Thornhill, Ontario, Canada L4J 2P6 (905) 881-7804 <http://www.9to5.com/9to5/NBC/>

Medicine Root Inc., Native Earth Products of North America, P.O. Box 353, Louisville, CO 80027 (303) 661-9819 Fax (303) 664-5139

Pemmican Publications, Unit #2 – 1635 Burrows Ave., Winnipeg, Manitoba R2X 0T1 Canada (204) 589-6346 pemmican@fox.nstn.ca <http://fox.nstn.ca/~pemmican>

Clear Light Distribution, 823 Don Diego, Santa Fe, NM 87501 (800) 253-2747 www.clearlightbooks.com

Tipi Press, St. Joseph's Indian School, Chamberlain, SD 57326 (800) 229-5684

Lakota Books, P.O. Box 140, Kendall Park, NJ 08824 Fax 908 940-9429

Talking Leaves Book Store, P.O. Box 519, Cherokee, NC 28719 (828) 497-6044

REVIEWING BOOKS/MATERIALS

Won in the Classroom, Guidelines for the Selection of Culturally Appropriate Materials, Indian Community School of Milwaukee, Inc. (414) 345-3040 www.ics-milw.org

Through Indian Eyes: The Native Experience in Books for Children by Beverly Slapin and Doris Seale, University of California, 1998. Oyate, 2702 Mathews St., Berkeley, CA 94702

TEACHER RESOURCES

Earth's Caretakers and Signs of Tradition: Native American Lessons, Math and Science Teachers for Reservation Schools (MASTERS) Project, University of Kansas, 1993 & 1994. (785) 864-4435 jnewland@ukans.edu

Keepers of the Earth, Keepers of the Animals, Keepers of Life, Keepers of the Night by Michael Caduto and Joseph Bruchac, Fulcrum Pub., 350 Indiana Street, Suite 350, Golden, CO, 80401, 1988-1998.

Native Science, Natural Laws of Interdependence by Gregory Cajete, Clear Light Pub., 2000.

Ignite the Sparkle: A Native American Science Education Curriculum Model by Gregory Cajete, Kavaki Press, Skyland, NC, 1999.

Indian Country: A History of Native People in America by Karen D. Harvey and Lisa D. Harjo, North American Press, 350 Indiana Street, Suite 350, Golden, CO 80401, 1994.

Rethinking Columbus, The Next 500 Years by Rethinking Schools, LTD. Available from Four Winds Books, York, NE.

Roots and Branches: A Resource of Native American Literature – Themes, Lessons and Bibliographies by Dorothea M. Susag, National Council of Teachers of English, 1998.

Reclaiming the Vision – Past, Present and Future: Native Voices for the Eighth Generation, Greenfield Review Press. Includes exercises to generate work from student writers. (505) 584-1728

ORGANIZATIONS AND PROJECTS

American Indian Science and Engineering Society, P.O. Box 9828, Albuquerque, NM 87119 Publishes Winds of Change Magazine. (505) 765-1052 www.aises.org

Science Through Native American Eyes, Cradleboard Teaching Project, Nihewan Foundation for American Indian Education founded by Buffy St. Marie. Interactive Multimedia CD Rom for grades 5-adult. www.cradleboard.org

D'Arcy McNickle Center for the History of the American Indian, The Newberry Library, Chicago, Summer Institutes for Secondary and Tribal College Teachers on Indian Literature. 312 943-9090

Wordcraft Circle of Native Writers and Storytellers publishes Moccasin Telegraph newsletter, 9 East Burnam Road, Columbia, MO 65203



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Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)*



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